

Sphere Rigidity

If at least one of two real normed spaces is finite-dimensional, their unit spheres are isometric in the chord metric exactly when the ambient spaces are linearly isometric. Equivalently, a surjective unit-sphere isometry yields a linear isometry equivalence of the ambient spaces under that finite-dimensional hypothesis.

Exact source: MathlibAnnex v0.4.0 · 467 declaration tiles · 28 levels

Finite-dimensional real normed spaces and surjective isometries between their unit spheres, with the theorem stated when at least one ambient space is finite-dimensional. The formalization includes radial extension, dimension transfer, determinant and Pluecker methods, analytic orientation tools, finite recovery, and ball-volume rigidity used in the proof architecture.

This Research Companion describes exact formal source and dependency structure. It does not assert completed Declaration Cards, document correspondence, or public LFH review.

Declaration Cards are in preparation. These 467 current-source tiles preserve the existing Project scope; route presets remain inactive because exact terminal metadata has not been owner-adopted.

[Exact Project source](#)

[Exact source manifest](#)

Proof architecture

R01 · Radial Extensions and Dimension — Radial extension of sphere isometries and transfer of finite-dimensional information. The route does not claim that the radial extension is linear or globally isometric; the recorded 3-Lipschitz bound is the source constant, not an optimality claim.

R02 · Compact Convex Hulls and Support Faces — Compact hulls, support faces, and finite lexicographic selection. The raw sets need not themselves be convex, nonemptiness is explicit, and finite-dimensional hypotheses appearing in the exact source are preserved.

R03 · Determinant Methods — Maximal-minor and determinant estimates with fixed row-order and sign conventions. Ordered row embeddings are not conflated with unordered row sets, and displayed bounds are not silently reinterpreted as Euclidean operator-norm statements.

R04 · Piola Identity and Null Lagrangians — Piola-type identities, null Lagrangians, determinant continuity, and boundary traces. The whole-space perturbation identity concerns the integral of the determinant difference; Strong L^n includes eventual integrability, and the trace used here is pointwise on the sphere.

R05 · Weak Gradient Zero and A.E. Constancy — Weak gradient zero implies local and global almost-everywhere constancy, not pointwise constancy. Compact C^1 test fields and divergence form the shared analytic base used by the orientation route.

R06 · Orientation and Signed Jacobians — Orientation and signed Jacobians on connected domains. No single global sign is asserted on a disconnected domain, and the null-image statement retained here is the same-dimension version present in the exact source.

R07 · Determinant-Maximizing Dual Frames — Determinant-maximizing dual frames and inverse bounds, including the zero-dimensional case. Mathlib providers are preferred for norming functionals; application-specific satellite-polynomial material remains provenance rather than a new public API claim.

R08 · Sphere-Volume Rigidity — Sphere-volume and ball-image rigidity. Compactness and inclusion in the relevant ball are explicit; equality of volume alone is not used to infer equality of sets without the separate inclusion hypothesis.

R09 · Determinant Factorization — A factorization route from proportional maximal minors, retained as a heavy-refactor proof seed rather than an independently completed tool. Scale, sign, row order, and nondegeneracy conditions remain explicit to prevent degenerate overgeneralization.

Boundary Inputs

3439 exact Boundary Inputs: EXTERNAL_COMPILED_DECLARATION 2632, OMITTED_INTERNAL_NATIVE_DECLARATION 807. Selected reachability is retained through every omitted internal declaration.

Real — Compiled external provider used by selected Project declarations.

Nat — Compiled external provider used by selected Project declarations.

Eq — Compiled external provider used by selected Project declarations.

OfNat.ofNat — Compiled external provider used by selected Project declarations.

Real.normedField — Compiled external provider used by selected Project declarations.

NormedAddCommGroup.toSeminormedAddCommGroup — Compiled external provider used by selected Project declarations.

Real.semiring — Compiled external provider used by selected Project declarations.

Semiring.toNonAssocSemiring — Compiled external provider used by selected Project declarations.

DFunLike.coe — Compiled external provider used by selected Project declarations.

UniformSpace.toTopologicalSpace — Compiled external provider used by selected Project declarations.

PseudoMetricSpace.toUniformSpace — Compiled external provider used by selected Project declarations.

NormedAddCommGroup.toAddCommGroup — Compiled external provider used by selected Project declarations.

id — Compiled external provider used by selected Project declarations.

NormedSpace.toModule — Compiled external provider used by selected Project declarations.

NormedAddCommGroup — Compiled external provider used by selected Project declarations.

Dependency-first reading route

Level 0

AEConstantOn

MathlibAnnex.AEConstantOn

Mathematical construction

Route / section: R05

Immediate prerequisites in this Project: None in this Project

Used by in this Project: targetJacobianSign_const_is_pm_one, compactLocalization_aeConstant_inner, aeConstantOn_of_countableCover, aeConstants_eq_of_open_overlap, ConstantRegion

[Read exact source](#)

BiLipschitzOpenData

MathlibAnnex.BilipschitzOrientation.BiLipschitzOpenData

Mathematical structure

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: f_injective, lipschitz_f, lipschitz_g, domainJacobianSign, fderiv_lower_bound, target_exceptional_null

[Read exact source](#)

volume_image_eq_zero_of_lipschitzWith

MathlibAnnex.BilipschitzOrientation.volume_image_eq_zero_of_lipschitzWith

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: target_exceptional_null, radialExtension_integral_abs_det

[Read exact source](#)

CompactC1VectorField

MathlibAnnex.CompactC1VectorField

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: carrier, contDiff, hasCompactSupport, ofSupport

[Read exact source](#)

Frame

MathlibAnnex.DeterminantFrame.Frame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: None in this Project

Used by in this Project: coordinateFrame, frameCoordinates, frameMap, frameMatrix, replaceRow, unitFrameSet, SatelliteConfiguration

[Read exact source](#)

NearMaxInverseBound

MathlibAnnex.DeterminantFrame.NearMaxInverseBound

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: None in this Project

Used by in this Project: K_nonneg, bound_sub, exists_nearMaxInverseBound, CoefficientDetectsUnit, frameCoordinates_mem_coefficientAnnulus, modelDist_framePreimage_le

[Read exact source](#)

coordinateEquiv

MathlibAnnex.DeterminantFrame.coordinateEquiv

Rigidity or equivalence result

Route / section: R07

Immediate prerequisites in this Project: None in this Project

Used by in this Project: bound_sub, frameCoordinates_eq_mulVec, functional_apply_eq_sum, inverseCoordinateMap, rawCoordinateRow

[Read exact source](#)

functionalCoordinates

MathlibAnnex.DeterminantFrame.functionalCoordinates

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: None in this Project

Used by in this Project: frameMatrix_replaceRow, functional_apply_eq_sum

[Read exact source](#)

unitRowSet

MathlibAnnex.DeterminantFrame.unitRowSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: None in this Project

Used by in this Project: unitRowSet_isCompact, mem_unitRowSet, unitFrameSet

[Read exact source](#)

EquivalentSeminorm

MathlibAnnex.EquivalentSeminorm

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: IsContraction, LinearIsometryEquiv, Space, closedUnitBall, eq_zero_of_apply_eq_zero, lipschitzWith_upper_of_model_bound, ofContinuousLinearEquiv, unitSphere, AlmostIsometryMatch, FinMapAlmostIsometric, LimitCertificate, LinearCertificate, abs_eval_lower_of_norms_nearby, frameCoordinates_norm_le_model, satelliteRowsSet

[Read exact source](#)

norm_apply_le_seminorm_of_lipschitz

MathlibAnnex.FDeriv.norm_apply_le_seminorm_of_lipschitz

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: ae_norm_apply_le_seminorm_of_lipschitz

[Read exact source](#)

satelliteAmbientDim

MathlibAnnex.FiniteSup.Bridge.satelliteAmbientDim

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: configurationFinMap, finMapBaseRow, finMapSatelliteRow

[Read exact source](#)

LocalAEConstantAt

MathlibAnnex.LocalAEConstantAt

Mathematical structure

Route / section: R05

Immediate prerequisites in this Project: None in this Project

Used by in this Project: exists_localAEConstantAt, constantRegion_compl_isOpen

[Read exact source](#)

MaximalMinorIndex

MathlibAnnex.Matrix.MaximalMinorIndex

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: None in this Project

Used by in this Project: ofOrderEmbedding, orderedRows

[Read exact source](#)

chartFactor

MathlibAnnex.Matrix.chartFactor

Mathematical construction

Route / section: R09

Immediate prerequisites in this Project: None in this Project

Used by in this Project: chartFactor_unique, mul_chartFactor_eq_of_orientedMaximalMinorsProportional, selectedSubmatrix_mul_chartFactor

[Read exact source](#)

det_smul_vecMul_nonsingInv_eq_updateRowDet

MathlibAnnex.Matrix.det_smul_vecMul_nonsingInv_eq_updateRowDet

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: None in this Project

Used by in this Project: rowCoordinates_eq_of_orientedMaximalMinorsProportional

[Read exact source](#)

exists_orderEmbedding_perm_of_injective

MathlibAnnex.Matrix.exists_orderEmbedding_perm_of_injective

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: None in this Project

Used by in this Project: orientedMaximalMinorsProportional_of_maximalMinorsProportional

[Read exact source](#)

orientedMaximalMinor

MathlibAnnex.Matrix.orientedMaximalMinor

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: None in this Project

Used by in this Project: OrientedMaximalMinorsProportional, chartFactor_unique, orientedMaximalMinor_eq_of_orderEmbedding, orientedMaximalMinor_eq_zero_of_not_injective, orientedMaximalMinor_permute, selectedSubmatrix_mul_chartFactor

[Read exact source](#)

rowL1Norm

MathlibAnnex.Matrix.rowL1Norm

Mathematical construction

Route / section: R03

Immediate prerequisites in this Project: None in this Project

Used by in this Project: `abs_det_le_prod_rowL1Norm`

[Read exact source](#)

submatrix_update_rowTuple

MathlibAnnex.Matrix.submatrix_update_rowTuple

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: None in this Project

Used by in this Project: `rowCoordinates_eq_of_orientedMaximalMinorsProportional`

[Read exact source](#)

StrongLnOperatorField

MathlibAnnex.MeasureTheory.StrongLnOperatorField

Measure or volume result

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: `tendsto_integral_det_of_strongLn`

[Read exact source](#)

lipschitz_fderiv_memLpOn_compact

MathlibAnnex.Mollification.lipschitz_fderiv_memLpOn_compact

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: `integrableOn_maximalMinor_fderiv_of_lipschitzWith`, `tendsto_integral_maximalMinor_mollify`

[Read exact source](#)

standardMollifier

MathlibAnnex.Mollification.standardMollifier

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: `standardMollifier_continuous`, `standardMollifier_hasCompactSupport`, `mollify`

[Read exact source](#)

maximizer

MathlibAnnex.NonemptyCompacts.maximizer

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: None in this Project

Used by in this Project: le_maximizer, maxValue, maximizer_mem

[Read exact source](#)

basisRow

MathlibAnnex.Piola.basisRow

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: basisRow_apply, cofactorRow, hessianCoordinate, singleOutputPerturb, sum_smul_basisRow, twoRowReplacement

[Read exact source](#)

coordinateDivergence

MathlibAnnex.Piola.coordinateDivergence

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: coordinateDivergence_eq_zero_of_not_mem_tsupport

[Read exact source](#)

det_updateRow_finset_sum

MathlibAnnex.Piola.det_updateRow_finset_sum

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: det_updateRow_eq_sum_mul_cofactorRow

[Read exact source](#)

exists_open_box_containing_compact

MathlibAnnex.Piola.exists_open_box_containing_compact

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: integral_coordinateDivergence_eq_zero_of_contDiff_hasCompactSupport

[Read exact source](#)

outputHybrid

MathlibAnnex.Piola.outputHybrid

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: outputHybrid_empty, outputHybrid_insert_eq_singleOutputPerturb, outputHybrid_univ

[Read exact source](#)

sum_symmetric_mul_antisymmetric_eq_zero

MathlibAnnex.Piola.sum_symmetric_mul_antisymmetric_eq_zero

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: None in this Project

Used by in this Project: sum_hessian_twoRowReplacement_eq_zero

[Read exact source](#)

FiniteCoefficientNet

MathlibAnnex.Satellite.FiniteCoefficientNet

Mathematical structure

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: exists_net_preimage_close

[Read exact source](#)

SatelliteRows

MathlibAnnex.Satellite.SatelliteRows

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: SatelliteConfiguration, satelliteRowsSet

[Read exact source](#)

abs_affine_endpoint_rigidity

MathlibAnnex.Satellite.abs_affine_endpoint_rigidity

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: absoluteMaximizer_satellite_norms_preimage

[Read exact source](#)

coefficientAnnulus

MathlibAnnex.Satellite.coefficientAnnulus

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: frameCoordinates_mem_coefficientAnnulus

[Read exact source](#)

interior_sdiff_nonempty

MathlibAnnex.SeminormBall.interior_sdiff_nonempty

Determinant or plucker component

Route / section: R08

Immediate prerequisites in this Project: None in this Project

Used by in this Project: measure_lt

[Read exact source](#)

map_le

MathlibAnnex.SeminormBall.map_le

Determinant or plucker component

Route / section: R08

Immediate prerequisites in this Project: None in this Project

Used by in this Project: map_le, map_eq

[Read exact source](#)

isometryEquiv_of_linearIsometryEquiv

MathlibAnnex.Sphere.isometryEquivOfLinearIsometryEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_finiteDimensional, nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_of_finiteDimensional

[Read exact source](#)

normalizeToSphere

MathlibAnnex.Sphere.normalizeToSphere

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: coe_normalizeToSphere, normalizeToSphere_pos_smul, normalizeToSphere_unit, radialExtension

[Read exact source](#)

scaled_normalize_dist_le_two

MathlibAnnex.Sphere.scaled_normalize_dist_le_two

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: None in this Project

Used by in this Project: radialExtension_lipschitz

[Read exact source](#)

LocalBallData

MathlibAnnex.WeakGradient.LocalBallData

Mathematical structure

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: carrier, inner, middle, exists_localBallData

[Read exact source](#)

compactLocalization

MathlibAnnex.WeakGradient.compactLocalization

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: compactLocalization_of_mem, compactLocalization_of_not_mem, compactLocalization_integrable, weakIntegral_eq_localized_bumpIntegral

[Read exact source](#)

shrinkingBump

MathlibAnnex.WeakGradient.shrinkingBump

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: localMollification, normalizedShrinkingBump, shrinkingBump_rIn, shrinkingBump_rOut, shrinkingBump_rOut_le_half, shrinkingBump_rOut_tendsto_zero

[Read exact source](#)

coordinate

MathlibAnnex.coordinate

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: None in this Project

Used by in this Project: allCoordinates

[Read exact source](#)

divergence

MathlibAnnex.divergence

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: divergence_eq_zero_of_not_mem_carrier, WeakDivergenceZero, divergence_pi, divergence_sub_smul

[Read exact source](#)

isCompact_convexHull_pi

MathlibAnnex.isCompact_convexHull_pi

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: None in this Project

Used by in this Project: derivativeAverage_mem_body

[Read exact source](#)

trace_smulRight

MathlibAnnex.trace_smulRight

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: None in this Project

Used by in this Project: divergence_sub_smul

[Read exact source](#)

Level 1

f_injective

MathlibAnnex.BilipschitzOrientation.BiLipschitzOpenData.f_injective

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData

Used by in this Project: weak_piola

[Read exact source](#)

lipschitz_f

MathlibAnnex.BilipschitzOrientation.BiLipschitzOpenData.lipschitz_f

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData

Used by in this Project: None in this Project

[Read exact source](#)

lipschitz_g

MathlibAnnex.BilipschitzOrientation.BiLipschitzOpenData.lipschitz_g

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData

Used by in this Project: None in this Project

[Read exact source](#)

domainJacobianSign

MathlibAnnex.BilipschitzOrientation.domainJacobianSign

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData

Used by in this Project: abs_domainJacobianSign, det_eq_domainSign_mul_abs, targetJacobianSign

[Read exact source](#)

fderiv_lower_bound

MathlibAnnex.BilipschitzOrientation.fderiv_lower_bound

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData

Used by in this Project: fderiv_injective

[Read exact source](#)

target_exceptional_null

MathlibAnnex.BilipschitzOrientation.target_exceptional_null

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: BiLipschitzOpenData, volume_image_eq_zero_of_lipschitzWith

Used by in this Project: signed_area_transfer

[Read exact source](#)

carrier

MathlibAnnex.CompactC1VectorField.carrier

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: CompactC1VectorField

Used by in this Project: carrier_ofSupport, carrier_compact, support_subset, tsupport_subset, WeakDivergenceZero, translatedBumpField_carrier_subset

[Read exact source](#)

contDiff

MathlibAnnex.CompactC1VectorField.contDiff

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: CompactC1VectorField

Used by in this Project: weak_piola, continuous

[Read exact source](#)

hasCompactSupport

MathlibAnnex.CompactC1VectorField.hasCompactSupport

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: CompactC1VectorField

Used by in this Project: None in this Project

[Read exact source](#)

ofSupport

MathlibAnnex.CompactC1VectorField.ofSupport

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: CompactC1VectorField

Used by in this Project: carrier_ofSupport, ofSupport_apply, translatedBumpField

[Read exact source](#)

K_nonneg

MathlibAnnex.DeterminantFrame.NearMaxInverseBound.boundConstant_nonneg

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: NearMaxInverseBound

Used by in this Project: exists_net_preimage_close

[Read exact source](#)

frameCoordinates

MathlibAnnex.DeterminantFrame.frameCoordinates

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame

Used by in this Project: frameCoordinates_eq_mulVec, frameCoordinates_norm_le_model

[Read exact source](#)

frameMap

MathlibAnnex.DeterminantFrame.frameMap

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame

Used by in this Project: frameMap_injective_of_det_ne_zero

[Read exact source](#)

frameMatrix

MathlibAnnex.DeterminantFrame.frameMatrix

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame

Used by in this Project: frameCoordinates_eq_mulVec, frameDeterminant, frameMatrix_coordinateFrame, frameMatrix_replaceRow

[Read exact source](#)

functional_apply_eq_sum

MathlibAnnex.DeterminantFrame.functional_apply_eq_sum

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateEquiv, functionalCoordinates

Used by in this Project: cramerReplacement

[Read exact source](#)

inverseCoordinateMap

MathlibAnnex.DeterminantFrame.inverseCoordinateMap

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateEquiv

Used by in this Project: inverseBoundConstant

[Read exact source](#)

unitRowSet_isCompact

MathlibAnnex.DeterminantFrame.isCompact_unitRowSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: unitRowSet

Used by in this Project: unitFrameSet_isCompact

[Read exact source](#)

mem_unitRowSet

MathlibAnnex.DeterminantFrame.mem_unitRowSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: unitRowSet

Used by in this Project: unitFrameSet_isCompact, mem_unitFrameSet, replaceRow_mem_unitFrameSet

[Read exact source](#)

rawCoordinateRow

MathlibAnnex.DeterminantFrame.rawCoordinateRow

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateEquiv

Used by in this Project: coordinateRowSize

[Read exact source](#)

replaceRow

MathlibAnnex.DeterminantFrame.replaceRow

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame

Used by in this Project: frameMatrix_replaceRow, replaceRow_mem_unitFrameSet, replacementDeterminant

[Read exact source](#)

unitFrameSet

MathlibAnnex.DeterminantFrame.unitFrameSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame, unitRowSet

Used by in this Project: unitFrameSet_isCompact, mem_unitFrameSet, replaceRow_mem_unitFrameSet

[Read exact source](#)

IsContraction

MathlibAnnex.EquivalentSeminorm.IsContraction

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: contractionSet, zero_isContraction, PluckerGeneratorGood, finMapConfiguration_mem, generators

[Read exact source](#)

LinearIsometryEquiv

MathlibAnnex.EquivalentSeminorm.LinearIsometryEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: exists_linearIsometryEquiv_of_pluckerBodies_eq, transportLinearIsometryEquiv

[Read exact source](#)

Space

MathlibAnnex.EquivalentSeminorm.Space

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: dist_space_eq, norm_space_eq, ofReference_toReference, sphere_apply, toReference_ofReference, toReference_sub, toReference_sub_ofReference, toReference_zero, CoefficientDetectsUnit, absoluteMaximizer_satellite_norms_preimage, frameCoordinates_mem_coefficientAnnulus, modelDist_framePreimage_le, satelliteBudget, radialExtension_image_ball

[Read exact source](#)

closedUnitBall

MathlibAnnex.EquivalentSeminorm.closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: closedUnitBallVolume, mem_closedUnitBall, zero_mem_closedUnitBall

[Read exact source](#)

eq_zero_of_apply_eq_zero

MathlibAnnex.EquivalentSeminorm.eq_zero_of_apply_eq_zero

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: dist_space_eq, sphere_apply, lower_of_ne_zero, CoefficientDetectsUnit, absoluteMaximizer_satellite_norms_preimage, frameCoordinates_mem_coefficientAnnulus, modelDist_framePreimage_le, satelliteBudget, radialExtension_image_ball

[Read exact source](#)

lipschitzWith_upper_of_model_bound

MathlibAnnex.EquivalentSeminorm.lipschitzWith_upper_of_model_bound

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: None in this Project

[Read exact source](#)

ofContinuousLinearEquiv

MathlibAnnex.EquivalentSeminorm.ofContinuousLinearEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: ofContinuousLinearEquiv_p_apply, unitSphereEquiv

[Read exact source](#)

unitSphere

MathlibAnnex.EquivalentSeminorm.unitSphere

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: mem_unitSphere, exists_extension_with_derivativeAverage_mem

[Read exact source](#)

ae_norm_apply_le_seminorm_of_lipschitz

MathlibAnnex.FDeriv.ae_norm_apply_le_seminorm_of_lipschitz

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: norm_apply_le_seminorm_of_lipschitz

Used by in this Project: derivativeGenerator_integrable_of_seminormLipschitz

[Read exact source](#)

AlmostIsometryMatch

MathlibAnnex.FiniteRecovery.AlmostIsometryMatch

Mathematical structure

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: exists_almostIsometryMatch_at_satelliteDimension

[Read exact source](#)

finMapBaseRow

MathlibAnnex.FiniteSup.Bridge.finMapBaseRow

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: satelliteAmbientDim

Used by in this Project: finMapConfiguration

[Read exact source](#)

finMapSatelliteRow

MathlibAnnex.FiniteSup.Bridge.finMapSatelliteRow

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: satelliteAmbientDim

Used by in this Project: finMapConfiguration

[Read exact source](#)

FinMapAlmostIsometric

MathlibAnnex.FiniteSup.FinMapAlmostIsometric

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: PluckerGeneratorGood, lower_of_ne_zero

[Read exact source](#)

ofOrderEmbedding

MathlibAnnex.Matrix.MaximalMinorIndex.ofOrderEmbedding

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: MaximalMinorIndex

Used by in this Project: orderedRows_ofOrderEmbedding, satellitePluckerCoefficients

[Read exact source](#)

orderedRows

MathlibAnnex.Matrix.MaximalMinorIndex.orderedRows

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: MaximalMinorIndex

Used by in this Project: selectedOutputLinearMap, orderedRows_ofOrderEmbedding, maximalSubmatrix

[Read exact source](#)

OrientedMaximalMinorsProportional

MathlibAnnex.Matrix.OrientedMaximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: orientedMaximalMinor

Used by in this Project: orientedMaximalMinorsProportional_of_maximalMinorsProportional, rowCoordinates_eq_of_orientedMaximalMinorsProportional, scale_eq_one_of_orientedMaximalMinorsProportional_zero

[Read exact source](#)

abs_det_le_prod_rowL1Norm

MathlibAnnex.Matrix.abs_det_le_prod_rowL1Norm

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: rowL1Norm

Used by in this Project: abs_det_sub_le_max

[Read exact source](#)

chartFactor_unique

MathlibAnnex.Matrix.chartFactor_unique

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: chartFactor, orientedMaximalMinor

Used by in this Project: existsUnique_factor_of_orientedMaximalMinorsProportional

[Read exact source](#)

orientedMaximalMinor_eq_zero_of_not_injective

MathlibAnnex.Matrix.orientedMaximalMinor_eq_zero_of_not_injective

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: orientedMaximalMinor

Used by in this Project: orientedMaximalMinorsProportional_of_maximalMinorsProportional

[Read exact source](#)

orientedMaximalMinor_permute

MathlibAnnex.Matrix.orientedMaximalMinor_permute

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: orientedMaximalMinor

Used by in this Project: orientedMaximalMinorsProportional_of_maximalMinorsProportional

[Read exact source](#)

selectedSubmatrix_mul_chartFactor

MathlibAnnex.Matrix.selectedSubmatrix_mul_chartFactor

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: chartFactor, orientedMaximalMinor

Used by in this Project: det_chartFactor

[Read exact source](#)

standardMollifier_continuous

MathlibAnnex.Mollification.continuous_standardMollifier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: standardMollifier

Used by in this Project: mollify_add

[Read exact source](#)

standardMollifier_hasCompactSupport

MathlibAnnex.Mollification.hasCompactSupport_standardMollifier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: standardMollifier

Used by in this Project: mollify_add

[Read exact source](#)

mollify

MathlibAnnex.Mollification.mollify

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: standardMollifier

Used by in this Project: mollify_contDiff, eventually_tsupport_mollify_subset_compact, mollify_add

[Read exact source](#)

le_maximizer

MathlibAnnex.NonemptyCompacts.le_maximizer

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maximizer

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, convexHull_maxSlice_eq_supportFace, le_maxValue_of_mem_convexHull

[Read exact source](#)

maxValue

MathlibAnnex.NonemptyCompacts.maxValue

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: maximizer

Used by in this Project: maxSlice, le_maxValue_of_mem_convexHull, supportFace

[Read exact source](#)

maximizer_mem

MathlibAnnex.NonemptyCompacts.maximizer_mem

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maximizer

Used by in this Project: maximizer_mem_maxSlice, maxValue_eq_of_convexHull_eq

[Read exact source](#)

map_le

MathlibAnnex.NormBall.map_le

Proposition or proof step

Route / section: R08

Immediate prerequisites in this Project: map_le

Used by in this Project: None in this Project

[Read exact source](#)

basisRow_apply

MathlibAnnex.Piola.basisRow_apply

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: divergence_cofactorRowField_eq_zero

[Read exact source](#)

cofactorRow

MathlibAnnex.Piola.cofactorRow

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: cofactorRowField, det_updateRow_eq_sum_mul_cofactorRow

[Read exact source](#)

coordinateDivergence_eq_zero_of_not_mem_tsupport

MathlibAnnex.Piola.coordinateDivergence_eq_zero_of_not_mem_tsupport

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: coordinateDivergence

Used by in this Project: integral_coordinateDivergence_eq_zero_of_contDiff_hasCompactSupport

[Read exact source](#)

hessianCoordinate

MathlibAnnex.Piola.hessianCoordinate

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: hessianCoordinate_comm

[Read exact source](#)

outputHybrid_empty

MathlibAnnex.Piola.outputHybrid_empty

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: outputHybrid

Used by in this Project: integral_det_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

outputHybrid_univ

MathlibAnnex.Piola.outputHybrid_univ

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: outputHybrid

Used by in this Project: integral_det_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

singleOutputPerturb

MathlibAnnex.Piola.singleOutputPerturb

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: divergence_componentFlux_eq_det_sub, outputHybrid_insert_eq_singleOutputPerturb

[Read exact source](#)

sum_smul_basisRow

MathlibAnnex.Piola.sum_smul_basisRow

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: det_updateRow_eq_sum_mul_cofactorRow

[Read exact source](#)

twoRowReplacement

MathlibAnnex.Piola.twoRowReplacement

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: basisRow

Used by in this Project: det_twoRowReplacement_swap

[Read exact source](#)

LimitCertificate

MathlibAnnex.PluckerRecovery.LimitCertificate

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: measure_image_unitBall_eq, exists_limitCertificate_of_pluckerBodies_eq

[Read exact source](#)

LinearCertificate

MathlibAnnex.PluckerRecovery.LinearCertificate

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: modelNorm_le_two, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

SatelliteConfiguration

MathlibAnnex.Satellite.SatelliteConfiguration

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: Frame, SatelliteRows

Used by in this Project: finMapConfiguration, configurationMap, configurationPolynomial, satelliteConfigurationSet

[Read exact source](#)

abs_eval_lower_of_norms_nearby

MathlibAnnex.Satellite.abs_eval_lower_of_norms_nearby

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm

Used by in this Project: absoluteMaximizer_satellites_almost_norm

[Read exact source](#)

satelliteRowsSet

MathlibAnnex.Satellite.satelliteRowsSet

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: EquivalentSeminorm, SatelliteRows

Used by in this Project: satelliteConfigurationSet

[Read exact source](#)

map_eq

MathlibAnnex.SeminormBall.map_eq

Determinant or plucker component

Route / section: R08

Immediate prerequisites in this Project: map_le

Used by in this Project: exists_linearIsometryEquiv_of_pluckerBodies_eq, map_eq

[Read exact source](#)

measure_lt

MathlibAnnex.SeminormBall.measure_lt

Measure or volume result

Route / section: R08

Immediate prerequisites in this Project: interior_sdiff_nonempty

Used by in this Project: measure_lt, image_unitBall_eq

[Read exact source](#)

coe_normalizeToSphere

MathlibAnnex.Sphere.coe_normalizeToSphere

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: normalizeToSphere

Used by in this Project: None in this Project

[Read exact source](#)

normalizeToSphere_pos_smul

MathlibAnnex.Sphere.normalizeToSphere_pos_smul

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: normalizeToSphere

Used by in this Project: None in this Project

[Read exact source](#)

normalizeToSphere_unit

MathlibAnnex.Sphere.normalizeToSphere_unit

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: normalizeToSphere

Used by in this Project: radialExtension_on_sphere

[Read exact source](#)

radialExtension

MathlibAnnex.Sphere.radialExtension

Mathematical construction

Route / section: R01

Immediate prerequisites in this Project: normalizeToSphere

Used by in this Project: radialExtension_of_ne_zero, radialExtension_zero

[Read exact source](#)

carrier

MathlibAnnex.WeakGradient.LocalBallData.carrier

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: LocalBallData

Used by in this Project: carrier_subset, inner_subset_carrier, carrier_isCompact, carrier_measurable, middle_subset_carrier

[Read exact source](#)

inner

MathlibAnnex.WeakGradient.LocalBallData.inner

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: LocalBallData

Used by in this Project: center_mem_inner, inner_subset_carrier, inner_isOpen, translated_closedBall_subset_middle

[Read exact source](#)

middle

MathlibAnnex.WeakGradient.LocalBallData.middle

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: LocalBallData

Used by in this Project: middle_subset_carrier, translated_closedBall_subset_middle

[Read exact source](#)

compactLocalization_of_mem

MathlibAnnex.WeakGradient.compactLocalization_of_mem

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: compactLocalization

Used by in this Project: compactLocalization_eq_ae_inner

[Read exact source](#)

compactLocalization_of_not_mem

MathlibAnnex.WeakGradient.compactLocalization_of_not_mem

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: compactLocalization

Used by in this Project: None in this Project

[Read exact source](#)

localMollification

MathlibAnnex.WeakGradient.localMollification

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: localMollification_tendsto_ae, localMollification_contDiff, localMollification_fderiv_apply

[Read exact source](#)

exists_localBallData

MathlibAnnex.WeakGradient.nonempty_localBallData

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: LocalBallData

Used by in this Project: exists_localAECConstantAt

[Read exact source](#)

normalizedShrinkingBump

MathlibAnnex.WeakGradient.normalizedShrinkingBump

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: localMollification_fderiv_apply, translatedBumpField

[Read exact source](#)

shrinkingBump_rIn

MathlibAnnex.WeakGradient.shrinkingBump_rIn

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: shrinkingBump_ratio

[Read exact source](#)

shrinkingBump_rOut

MathlibAnnex.WeakGradient.shrinkingBump_rOut

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: shrinkingBump_ratio

[Read exact source](#)

shrinkingBump_rOut_le_half

MathlibAnnex.WeakGradient.shrinkingBump_rOut_le_half

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: translatedBumpField_carrier_subset

[Read exact source](#)

shrinkingBump_rOut_tendsto_zero

MathlibAnnex.WeakGradient.tendsto_shrinkingBump_rOut_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump

Used by in this Project: localMollification_tendsto_ae

[Read exact source](#)

aeConstantOn_of_countableCover

MathlibAnnex.aeConstantOn_of_countableCover

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: AEConstantOn

Used by in this Project: aeConstantOn_of_everywhere_local

[Read exact source](#)

aeConstants_eq_of_open_overlap

MathlibAnnex.aeConstants_eq_of_open_overlap

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: AEConstantOn

Used by in this Project: constantRegion_compl_isOpen

[Read exact source](#)

allCoordinates

MathlibAnnex.allCoordinates

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: coordinate

Used by in this Project: coordinate_mem_allCoordinates

[Read exact source](#)

ConstantRegion

MathlibAnnex.constantRegion

Mathematical construction

Route / section: R05

Immediate prerequisites in this Project: AEConstantOn

Used by in this Project: constantRegion_isOpen, constantRegion_compl_isOpen

[Read exact source](#)

divergence_pi

MathlibAnnex.divergence_pi

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: divergence

Used by in this Project: weak_piola

[Read exact source](#)

divergence_sub_smul

MathlibAnnex.divergence_sub_smul

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: divergence, trace_smulRight

Used by in this Project: divergence_translatedBumpField

[Read exact source](#)

Level 2

abs_domainJacobianSign

MathlibAnnex.BilipschitzOrientation.abs_domainJacobianSign

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: domainJacobianSign

Used by in this Project: abs_targetJacobianSign, signed_area_transfer

[Read exact source](#)

fderiv_injective

MathlibAnnex.BilipschitzOrientation.fderiv_injective

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: fderiv_lower_bound

Used by in this Project: det_fderiv_ne_zero

[Read exact source](#)

targetJacobianSign

MathlibAnnex.BilipschitzOrientation.targetJacobianSign

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: domainJacobianSign

Used by in this Project: abs_targetJacobianSign, signed_area_transfer

[Read exact source](#)

carrier_ofSupport

MathlibAnnex.CompactC1VectorField.carrier_ofSupport

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier, ofSupport

Used by in this Project: None in this Project

[Read exact source](#)

continuous

MathlibAnnex.CompactC1VectorField.continuous

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: contDiff

Used by in this Project: None in this Project

[Read exact source](#)

carrier_compact

MathlibAnnex.CompactC1VectorField.isCompact_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: weak_piola

[Read exact source](#)

ofSupport_apply

MathlibAnnex.CompactC1VectorField.ofSupport_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: ofSupport

Used by in this Project: None in this Project

[Read exact source](#)

support_subset

MathlibAnnex.CompactC1VectorField.support_subset

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: weak_piola

[Read exact source](#)

tsupport_subset

MathlibAnnex.CompactC1VectorField.tsupport_subset

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: fderiv_eq_zero_of_not_mem_carrier

[Read exact source](#)

abs_det_sub_le_max

MathlibAnnex.ContinuousLinearMap.abs_det_sub_le_max

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: abs_det_le_prod_rowL1Norm

Used by in this Project: abs_det_sub_le

[Read exact source](#)

selectedOutputLinearMap

MathlibAnnex.ContinuousLinearMap.selectedOutputLinearMap

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: orderedRows

Used by in this Project: norm_selectedOutputLinearMap_le

[Read exact source](#)

coordinateRowSize

MathlibAnnex.DeterminantFrame.coordinateRowSize

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: rawCoordinateRow

Used by in this Project: coordinateRowSize_nonneg, coordinateScale, norm_rawCoordinateRow_le_size

[Read exact source](#)

frameCoordinates_eq_mulVec

MathlibAnnex.DeterminantFrame.frameCoordinates_eq_mulVec

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateEquiv, frameCoordinates, frameMatrix

Used by in this Project: frameMap_injective_of_det_ne_zero, inverse_mulVec_frameCoordinates

[Read exact source](#)

frameDeterminant

MathlibAnnex.DeterminantFrame.frameDeterminant

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameMatrix

Used by in this Project: frameDeterminant_continuous, frameDeterminant_coordinateFrame, frameMap_injective_of_det_ne_zero, replacementDeterminant

[Read exact source](#)

frameMatrix_replaceRow

MathlibAnnex.DeterminantFrame.frameMatrix_replaceRow

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameMatrix, functionalCoordinates, replaceRow

Used by in this Project: replacementDeterminant_eq_cramerTranspose, pluckerPairing_satelliteCoefficients_maximalMinors, absoluteMaximizer_base_nearMax

[Read exact source](#)

unitFrameSet_isCompact

MathlibAnnex.DeterminantFrame.isCompact_unitFrameSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: unitRowSet_isCompact, mem_unitRowSet, unitFrameSet

Used by in this Project: exists_maximizingFrame

[Read exact source](#)

mem_unitFrameSet

MathlibAnnex.DeterminantFrame.mem_unitFrameSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: mem_unitRowSet, unitFrameSet

Used by in this Project: coordinateFrame_mem, unitFrameSet_nonempty

[Read exact source](#)

replaceRow_mem_unitFrameSet

MathlibAnnex.DeterminantFrame.replaceRow_mem_unitFrameSet

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: mem_unitRowSet, replaceRow, unitFrameSet

Used by in this Project: abs_replacementDeterminant_le_maximum

[Read exact source](#)

closedUnitBallVolume

MathlibAnnex.EquivalentSeminorm.closedUnitBallVolume

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBall

Used by in this Project: closedUnitBallVolume_pos, ballVolumeScaledMaximalMinors, measure_image_unitBall_eq, radialExtension_integral_abs_det

[Read exact source](#)

contractionSet

MathlibAnnex.EquivalentSeminorm.contractionSet

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: IsContraction

Used by in this Project: mem_contractionSet, generators_eq_image_union

[Read exact source](#)

dist_space_eq

MathlibAnnex.EquivalentSeminorm.dist_space_eq

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space, eq_zero_of_apply_eq_zero

Used by in this Project: sphereIsometryEquiv, derivativeAverage_comp_linear_radial_apply, exists_extension_with_derivativeAverage_mem, radialExtension_integral_abs_det

[Read exact source](#)

zero_isContraction

MathlibAnnex.EquivalentSeminorm.isContraction_zero

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: IsContraction

Used by in this Project: generators_nonempty

[Read exact source](#)

mem_closedUnitBall

MathlibAnnex.EquivalentSeminorm.mem_closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBall

Used by in this Project: closedUnitBall_isBounded, zero_mem_interior_closedUnitBall

[Read exact source](#)

mem_unitSphere

MathlibAnnex.EquivalentSeminorm.mem_unitSphere

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: unitSphere

Used by in this Project: None in this Project

[Read exact source](#)

norm_space_eq

MathlibAnnex.EquivalentSeminorm.norm_space_eq

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

ofContinuousLinearEquiv_p_apply

MathlibAnnex.EquivalentSeminorm.ofContinuousLinearEquiv_p_apply

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: ofContinuousLinearEquiv

Used by in this Project: transportLinearIsometryEquiv

[Read exact source](#)

ofReference_toReference

MathlibAnnex.EquivalentSeminorm.ofReference_toReference

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

sphere_apply

MathlibAnnex.EquivalentSeminorm.sphere_apply

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space, eq_zero_of_apply_eq_zero

Used by in this Project: unitSphereEquiv

[Read exact source](#)

toReference_ofReference

MathlibAnnex.EquivalentSeminorm.toReference_ofReference

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

toReference_sub

MathlibAnnex.EquivalentSeminorm.toReference_sub

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

toReference_sub_ofReference

MathlibAnnex.EquivalentSeminorm.toReference_sub_ofReference

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

toReference_zero

MathlibAnnex.EquivalentSeminorm.toReference_zero

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: Space

Used by in this Project: None in this Project

[Read exact source](#)

zero_mem_closedUnitBall

MathlibAnnex.EquivalentSeminorm.zero_mem_closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBall

Used by in this Project: closedUnitBall_nonempty

[Read exact source](#)

finMapConfiguration

MathlibAnnex.FiniteSup.Bridge.finMapConfiguration

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: finMapBaseRow, finMapSatelliteRow, SatelliteConfiguration

Used by in this Project: configurationFinMap_finMapConfiguration, finMapConfiguration_base_apply, finMapConfiguration_configurationFinMap, finMapConfiguration_mem, finMapConfiguration_satellite_apply

[Read exact source](#)

lower_of_ne_zero

MathlibAnnex.FiniteSup.FinMapAlmostIsometric.lower_of_ne_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: eq_zero_of_apply_eq_zero, FinMapAlmostIsometric

Used by in this Project: exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

configurationMap

MathlibAnnex.FiniteSup.configurationMap

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: SatelliteConfiguration

Used by in this Project: configurationFinMap, configurationMap_norm_gt_of_satellite, configurationMap_norm_le_model

[Read exact source](#)

orderedRows_ofOrderEmbedding

MathlibAnnex.Matrix.MaximalMinorIndex.orderedRows_ofOrderEmbedding

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: ofOrderEmbedding, orderedRows

Used by in this Project: weak_piola, maximalSubmatrix_ofOrderEmbedding, radialExtension_integral_abs_det

[Read exact source](#)

det_chartFactor

MathlibAnnex.Matrix.det_chartFactor

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: selectedSubmatrix_mul_chartFactor

Used by in this Project: existsUnique_factor_of_orientedMaximalMinorsProportional, isUnit_chartFactor_of_scale_ne_zero

[Read exact source](#)

maximalSubmatrix

MathlibAnnex.Matrix.maximalSubmatrix

Mathematical construction

Route / section: R03

Immediate prerequisites in this Project: orderedRows

Used by in this Project: maximalMinor, maximalSubmatrix_mul, maximalSubmatrix_mulVec, maximalSubmatrix_ofOrderEmbedding, maximalSubmatrix_zero

[Read exact source](#)

rowCoordinates_eq_of_orientedMaximalMinorsProportional

MathlibAnnex.Matrix.rowCoordinates_eq_of_orientedMaximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: OrientedMaximalMinorsProportional, det_smul_vecMul_nonsingInv_eq_updateRowDet, submatrix_update_rowTuple

Used by in this Project: mul_chartFactor_eq_of_orientedMaximalMinorsProportional

[Read exact source](#)

scale_eq_one_of_orientedMaximalMinorsProportional_zero

MathlibAnnex.Matrix.scale_eq_one_of_orientedMaximalMinorsProportional_zero

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: OrientedMaximalMinorsProportional

Used by in this Project: None in this Project

[Read exact source](#)

mollify_contDiff

MathlibAnnex.Mollification.contDiff_mollify

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: mollify

Used by in this Project: eventually_mollify_fderiv_memLpOn_compact, maximalMinorIntegrand_mollify_continuous

[Read exact source](#)

eventually_tsupport_mollify_subset_compact

MathlibAnnex.Mollification.eventually_tsupport_mollify_subset_compact

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: mollify

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

mollify_add

MathlibAnnex.Mollification.mollify_add

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: standardMollifier_continuous, standardMollifier_hasCompactSupport, mollify

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

maxSlice

MathlibAnnex.NonemptyCompacts.maxSlice

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: maxValue

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, maxSlice_isCompact, maximizer_mem_maxSlice, convexHull_maxSlice_eq_supportFace

[Read exact source](#)

map_eq

MathlibAnnex.NormBall.map_eq

Proposition or proof step

Route / section: R08

Immediate prerequisites in this Project: map_eq

Used by in this Project: None in this Project

[Read exact source](#)

measure_It

MathlibAnnex.NormBall.measure_It

Measure or volume result

Route / section: R08

Immediate prerequisites in this Project: measure_It

Used by in this Project: None in this Project

[Read exact source](#)

cofactorRowField

MathlibAnnex.Piola.cofactorRowField

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: cofactorRow

Used by in this Project: componentFlux, piola_divergence_eq_zero_of_expansion

[Read exact source](#)

det_twoRowReplacement_swap

MathlibAnnex.Piola.det_twoRowReplacement_swap

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: twoRowReplacement

Used by in this Project: sum_hessian_twoRowReplacement_eq_zero

[Read exact source](#)

det_updateRow_eq_sum_mul_cofactorRow

MathlibAnnex.Piola.det_updateRow_eq_sum_mul_cofactorRow

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: cofactorRow, det_updateRow_finset_sum, sum_smul_basisRow

Used by in this Project: divergence_componentFlux_eq_det_sub

[Read exact source](#)

hessianCoordinate_comm

MathlibAnnex.Piola.hessianCoordinate_comm

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: hessianCoordinate

Used by in this Project: sum_hessianCoordinate_twoRowReplacement_eq_zero

[Read exact source](#)

integral_coordinateDivergence_eq_zero_of_contDiff_hasCompactSupport

MathlibAnnex.Piola.integral_coordinateDivergence_eq_zero_of_contDiff_hasCompactSupport

Measure or volume result

Route / section: R04

Immediate prerequisites in this Project: coordinateDivergence_eq_zero_of_not_mem_tsupport, exists_open_box_containing_compact

Used by in this Project: integral_det_singleOutputPerturb_sub_eq_zero

[Read exact source](#)

outputHybrid_insert_eq_singleOutputPerturb

MathlibAnnex.Piola.outputHybrid_insert_eq_singleOutputPerturb

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: outputHybrid, singleOutputPerturb

Used by in this Project: integral_det_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

modelNorm_le_two

MathlibAnnex.PluckerRecovery.LinearCertificate.seminorm_linearMap_le_two_mul

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: LinearCertificate

Used by in this Project: referenceNorm_le

[Read exact source](#)

satellitePluckerCoefficients

MathlibAnnex.PluckerSupport.satellitePluckerCoefficients

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: ofOrderEmbedding

Used by in this Project: orientedSatelliteSupport, pluckerPairing_satelliteCoefficients_maximalMinors

[Read exact source](#)

frameCoordinates_norm_le_model

MathlibAnnex.Satellite.frameCoordinates_norm_le_model

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: frameCoordinates, EquivalentSeminorm

Used by in this Project: frameCoordinates_mem_coefficientAnnulus

[Read exact source](#)

satelliteConfigurationSet

MathlibAnnex.Satellite.satelliteConfigurationSet

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: SatelliteConfiguration, satelliteRowsSet

Used by in this Project: finMapConfiguration_mem, configurationMap_norm_le_model, absoluteMaximizer_base_nearMax, absoluteMaximizer_satellite_norms_preimage, maxSatelliteConfiguration

[Read exact source](#)

radialExtension_of_ne_zero

MathlibAnnex.Sphere.radialExtension_of_ne_zero

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension

Used by in this Project: radialExtension_norm, radialExtension_on_sphere

[Read exact source](#)

radialExtension_zero

MathlibAnnex.Sphere.radialExtension_zero

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension

Used by in this Project: radialExtension_norm

[Read exact source](#)

WeakDivergenceZero

MathlibAnnex.WeakDivergenceZero

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier, divergence

Used by in this Project: targetJacobianSign_weakDivergenceZero, weakIntegral_eq_localized_bumpIntegral

[Read exact source](#)

carrier_subset

MathlibAnnex.WeakGradient.LocalBallData.carrier_subset

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: middle_subset_open, integrableOn_localBallCarrier

[Read exact source](#)

center_mem_inner

MathlibAnnex.WeakGradient.LocalBallData.center_mem_inner

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: inner

Used by in this Project: inner_nonempty

[Read exact source](#)

inner_subset_carrier

MathlibAnnex.WeakGradient.LocalBallData.inner_subset_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier, inner

Used by in this Project: compactLocalization_eq_ae_inner

[Read exact source](#)

carrier_isCompact

MathlibAnnex.WeakGradient.LocalBallData.isCompact_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: integrableOn_localBallCarrier

[Read exact source](#)

inner_isOpen

MathlibAnnex.WeakGradient.LocalBallData.isOpen_inner

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: inner

Used by in this Project: compactLocalization_eq_ae_inner, exists_localMollification_constant, localBall_inner_measure_pos

[Read exact source](#)

carrier_measurable

MathlibAnnex.WeakGradient.LocalBallData.measurableSet_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier

Used by in this Project: compactLocalization_integrable

[Read exact source](#)

middle_subset_carrier

MathlibAnnex.WeakGradient.LocalBallData.middle_subset_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier, middle

Used by in this Project: middle_subset_open

[Read exact source](#)

translated_closedBall_subset_middle

MathlibAnnex.WeakGradient.LocalBallData.translated_closedBall_subset_middle

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: inner, middle

Used by in this Project: translatedBumpField_carrier_subset

[Read exact source](#)

localMollification_fderiv_apply

MathlibAnnex.WeakGradient.localMollification_fderiv_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: localMollification, normalizedShrinkingBump

Used by in this Project: localMollification_fderiv_apply_eq_zero

[Read exact source](#)

shrinkingBump_ratio

MathlibAnnex.WeakGradient.shrinkingBump_ratio

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: shrinkingBump_rIn, shrinkingBump_rOut

Used by in this Project: localMollification_tendsto_ae

[Read exact source](#)

translatedBumpField

MathlibAnnex.WeakGradient.translatedBumpField

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: ofSupport, normalizedShrinkingBump

Used by in this Project: divergence_translatedBumpField, translatedBumpField_carrier_subset

[Read exact source](#)

aeConstantOn_of_everywhere_local

MathlibAnnex.aeConstantOn_of_everywhere_local

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: aeConstantOn_of_countableCover

Used by in this Project: exists_aeConstantOn_of_local

[Read exact source](#)

coordinate_mem_allCoordinates

MathlibAnnex.coordinate_mem_allCoordinates

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: allCoordinates

Used by in this Project: allCoordinates_separate

[Read exact source](#)

constantRegion_isOpen

MathlibAnnex.isOpen_constantRegion

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: ConstantRegion

Used by in this Project: constantRegion_eq_of_preconnected

[Read exact source](#)

constantRegion_compl_isOpen

MathlibAnnex.isOpen_constantRegion_compl

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: LocalAECConstantAt, aeConstants_eq_of_open_overlap, ConstantRegion

Used by in this Project: constantRegion_eq_of_preconnected

[Read exact source](#)

le_maxValue_of_mem_convexHull

MathlibAnnex.le_maxValue_of_mem_convexHull

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: le_maximizer, maxValue

Used by in this Project: maxValue_eq_of_convexHull_eq

[Read exact source](#)

supportFace

MathlibAnnex.supportFace

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: maxValue

Used by in this Project: convexHull_maxSlice_eq_supportFace

[Read exact source](#)

Level 3

abs_targetJacobianSign

MathlibAnnex.BilipschitzOrientation.abs_targetJacobianSign

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_domainJacobianSign, targetJacobianSign

Used by in this Project: targetJacobianSign_locallyIntegrableOn, targetJacobianSign_const_is_pm_one

[Read exact source](#)

det_fderiv_ne_zero

MathlibAnnex.BilipschitzOrientation.det_fderiv_ne_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: fderiv_injective

Used by in this Project: det_eq_domainSign_mul_abs

[Read exact source](#)

fderiv_eq_zero_of_not_mem_carrier

MathlibAnnex.CompactC1VectorField.fderiv_eq_zero_of_not_mem_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: tsupport_subset

Used by in this Project: weak_piola, divergence_eq_zero_of_not_mem_carrier, weakIntegral_eq_localized_bumpIntegral

[Read exact source](#)

abs_det_sub_le

MathlibAnnex.ContinuousLinearMap.abs_det_sub_le

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: abs_det_sub_le_max

Used by in this Project: norm_det_sub_le

[Read exact source](#)

norm_selectedOutputLinearMap_le

MathlibAnnex.ContinuousLinearMap.norm_selectedOutputLinearMap_le

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutputLinearMap

Used by in this Project: selectedOutput

[Read exact source](#)

frameDeterminant_continuous

MathlibAnnex.DeterminantFrame.continuous_frameDeterminant

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameDeterminant

Used by in this Project: exists_maximizingFrame, maxSatelliteConfiguration

[Read exact source](#)

coordinateRowSize_nonneg

MathlibAnnex.DeterminantFrame.coordinateRowSize_nonneg

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateRowSize

Used by in this Project: coordinateScale_pos

[Read exact source](#)

coordinateScale

MathlibAnnex.DeterminantFrame.coordinateScale

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateRowSize

Used by in this Project: coordinateInverseFactor, coordinateRow, coordinateScale_pos

[Read exact source](#)

norm_rawCoordinateRow_le_size

MathlibAnnex.DeterminantFrame.norm_rawCoordinateRow_le_size

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateRowSize

Used by in this Project: coordinateFrame_mem

[Read exact source](#)

replacementDeterminant

MathlibAnnex.DeterminantFrame.replacementDeterminant

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameDeterminant, replaceRow

Used by in this Project: abs_replacementDeterminant_le_maximum, replacementDeterminant_eq_cramerTranspose, satellitePolynomial

[Read exact source](#)

unitFrameSet_nonempty

MathlibAnnex.DeterminantFrame.unitFrameSet_nonempty

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: mem_unitFrameSet

Used by in this Project: exists_maximizingFrame

[Read exact source](#)

closedUnitBall_nonempty

MathlibAnnex.EquivalentSeminorm.closedUnitBall_nonempty

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: zero_mem_closedUnitBall

Used by in this Project: None in this Project

[Read exact source](#)

closedUnitBall_isBounded

MathlibAnnex.EquivalentSeminorm.isBounded_closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: mem_closedUnitBall

Used by in this Project: closedUnitBall_isCompact

[Read exact source](#)

mem_contractionSet

MathlibAnnex.EquivalentSeminorm.mem_contractionSet

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: contractionSet

Used by in this Project: None in this Project

[Read exact source](#)

transportLinearIsometryEquiv

MathlibAnnex.EquivalentSeminorm.transportLinearIsometryEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: LinearIsometryEquiv, ofContinuousLinearEquiv_p_apply

Used by in this Project: linearIsometryEquiv_of_coordinate_model

[Read exact source](#)

unitSphereEquiv

MathlibAnnex.EquivalentSeminorm.unitSphereEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: ofContinuousLinearEquiv, sphere_apply

Used by in this Project: sphereIsometryEquiv

[Read exact source](#)

zero_mem_interior_closedUnitBall

MathlibAnnex.EquivalentSeminorm.zero_mem_interior_closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: mem_closedUnitBall

Used by in this Project: closedUnitBallVolume_pos

[Read exact source](#)

configurationFinMap

MathlibAnnex.FiniteSup.Bridge.configurationFinMap

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: satelliteAmbientDim, configurationMap

Used by in this Project: configurationFinMap_apply_base, configurationFinMap_apply_satellite, configurationFinMap_finMapConfiguration, configurationFinMap_norm

[Read exact source](#)

finMapConfiguration_base_apply

MathlibAnnex.FiniteSup.Bridge.finMapConfiguration_base_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: finMapConfiguration

Used by in this Project: None in this Project

[Read exact source](#)

finMapConfiguration_mem

MathlibAnnex.FiniteSup.Bridge.finMapConfiguration_mem

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: IsContraction, finMapConfiguration, satelliteConfigurationSet

Used by in this Project: configuration_contraction_iff

[Read exact source](#)

finMapConfiguration_satellite_apply

MathlibAnnex.FiniteSup.Bridge.finMapConfiguration_satellite_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: finMapConfiguration

Used by in this Project: None in this Project

[Read exact source](#)

configurationMap_norm_gt_of_satellite

MathlibAnnex.FiniteSup.configurationMap_norm_gt_of_satellite

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationMap

Used by in this Project: maxNetConfigurationMap_lower_of_ne_zero

[Read exact source](#)

configurationMap_norm_le_model

MathlibAnnex.FiniteSup.configurationMap_norm_le_model

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationMap, satelliteConfigurationSet

Used by in this Project: configurationFinMap_norm_le_model

[Read exact source](#)

isUnit_chartFactor_of_scale_ne_zero

MathlibAnnex.Matrix.isUnit_chartFactor_of_scale_ne_zero

Proposition or proof step

Route / section: R09

Immediate prerequisites in this Project: det_chartFactor

Used by in this Project: None in this Project

[Read exact source](#)

maximalMinor

MathlibAnnex.Matrix.maximalMinor

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalSubmatrix

Used by in this Project: det_selectedSquare, MaximalMinorsProportional, maximalMinor_mul, maximalMinor_ofOrderEmbedding, maximalMinor_zero_of_pos, maximalMinors, mulVec_injective_of_maximalMinor_ne_zero

[Read exact source](#)

maximalSubmatrix_mul

MathlibAnnex.Matrix.maximalSubmatrix_mul

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: maximalSubmatrix

Used by in this Project: maximalMinor_mul

[Read exact source](#)

maximalSubmatrix_mulVec

MathlibAnnex.Matrix.maximalSubmatrix_mulVec

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: maximalSubmatrix

Used by in this Project: mulVec_injective_of_maximalMinor_ne_zero

[Read exact source](#)

maximalSubmatrix_ofOrderEmbedding

MathlibAnnex.Matrix.maximalSubmatrix_ofOrderEmbedding

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: orderedRows_ofOrderEmbedding, maximalSubmatrix

Used by in this Project: maximalMinor_ofOrderEmbedding

[Read exact source](#)

maximalSubmatrix_zero

MathlibAnnex.Matrix.maximalSubmatrix_zero

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: maximalSubmatrix

Used by in this Project: maximalMinor_zero_of_pos

[Read exact source](#)

mul_chartFactor_eq_of_orientedMaximalMinorsProportional

MathlibAnnex.Matrix.mul_chartFactor_eq_of_orientedMaximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: chartFactor, rowCoordinates_eq_of_orientedMaximalMinorsProportional

Used by in this Project: existsUnique_factor_of_orientedMaximalMinorsProportional,
mul_chartFactor_eq_of_maximalMinorsProportional

[Read exact source](#)

eventually_mollify_fderiv_memLpOn_compact

MathlibAnnex.Mollification.eventually_mollify_fderiv_memLpOn_compact

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: mollify_contDiff

Used by in this Project: tendsto_eLpNorm_fderiv_mollify_sub

[Read exact source](#)

maxSlice_isCompact

MathlibAnnex.NonemptyCompacts.isCompact_maxSlice

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maxSlice

Used by in this Project: refine

[Read exact source](#)

maximizer_mem_maxSlice

MathlibAnnex.NonemptyCompacts.maximizer_mem_maxSlice

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maxSlice, maximizer_mem

Used by in this Project: maxSlice_nonempty

[Read exact source](#)

componentFlux

MathlibAnnex.Piola.componentFlux

Mathematical construction

Route / section: R04

Immediate prerequisites in this Project: cofactorRowField

Used by in this Project: divergence_componentFlux_eq_det_sub, support_componentFlux_subset

[Read exact source](#)

sum_hessian_twoRowReplacement_eq_zero

MathlibAnnex.Piola.sum_hessian_twoRowReplacement_eq_zero

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: det_twoRowReplacement_swap, sum_symmetric_mul_antisymmetric_eq_zero

Used by in this Project: sum_hessianCoordinate_twoRowReplacement_eq_zero

[Read exact source](#)

referenceNorm_le

MathlibAnnex.PluckerRecovery.LinearCertificate.referenceNorm_le

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: modelNorm_le_two

Used by in this Project: exists_limitCertificate_of_pluckerBodies_eq

[Read exact source](#)

radialExtension_norm

MathlibAnnex.Sphere.radialExtension_norm

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_of_ne_zero, radialExtension_zero

Used by in this Project: radialExtension_lipschitz, radialExtension_leftInverse

[Read exact source](#)

radialExtension_on_sphere

MathlibAnnex.Sphere.radialExtension_on_sphere

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: normalizeToSphere_unit, radialExtension_of_ne_zero

Used by in this Project: normalizedGenerator_mem_of_spherelsometry

[Read exact source](#)

inner_nonempty

MathlibAnnex.WeakGradient.LocalBallData.inner_nonempty

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: center_mem_inner

Used by in this Project: localBall_inner_measure_pos

[Read exact source](#)

middle_subset_open

MathlibAnnex.WeakGradient.LocalBallData.middle_subset_open

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier_subset, middle_subset_carrier

Used by in this Project: translatedBumpField_carrier_subset

[Read exact source](#)

localMollification_tendsto_ae

MathlibAnnex.WeakGradient.ae_tendsto_localMollification

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: localMollification, shrinkingBump_ratio, shrinkingBump_rOut_tendsto_zero

Used by in this Project: exists_inner_convergencePoint

[Read exact source](#)

compactLocalization_eq_ae_inner

MathlibAnnex.WeakGradient.compactLocalization_eq_ae_inner

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: inner_subset_carrier, inner_isOpen, compactLocalization_of_mem

Used by in this Project: exists_aeConstant_inner

[Read exact source](#)

divergence_translatedBumpField

MathlibAnnex.WeakGradient.divergence_translatedBumpField

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: translatedBumpField, divergence_sub_smul

Used by in this Project: localMollification_fderiv_apply_eq_zero

[Read exact source](#)

integrableOn_localBallCarrier

MathlibAnnex.WeakGradient.integrableOn_localBallCarrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier_subset, carrier_isCompact

Used by in this Project: compactLocalization_integrable

[Read exact source](#)

allCoordinates_separate

MathlibAnnex.allCoordinates_separate

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: coordinate_mem_allCoordinates

Used by in this Project: exists_common_pi

[Read exact source](#)

constantRegion_eq_of_preconnected

MathlibAnnex.constantRegion_eq_of_preconnected

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: constantRegion_isOpen, constantRegion_compl_isOpen

Used by in this Project: exists_aeConstantOn_of_local

[Read exact source](#)

convexHull_maxSlice_eq_supportFace

MathlibAnnex.convexHull_maxSlice_eq_supportFace

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: le_maximizer, maxSlice, supportFace

Used by in this Project: refine_convexHull_eq

[Read exact source](#)

maxValue_eq_of_convexHull_eq

MathlibAnnex.maxValue_eq_of_convexHull_eq

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maximizer_mem, le_maxValue_of_mem_convexHull

Used by in this Project: refine_convexHull_eq

[Read exact source](#)

Level 4

det_eq_domainSign_mul_abs

MathlibAnnex.BilipschitzOrientation.det_eq_domainSign_mul_abs

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: det_fderiv_ne_zero, domainJacobianSign

Used by in this Project: signed_area_transfer

[Read exact source](#)

targetJacobianSign_locallyIntegrableOn

MathlibAnnex.BilipschitzOrientation.locallyIntegrableOn_targetJacobianSign

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_targetJacobianSign

Used by in this Project: targetJacobianSign_ae_const

[Read exact source](#)

targetJacobianSign_const_is_pm_one

MathlibAnnex.BilipschitzOrientation.targetJacobianSign_const_is_pm_one

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: AEConstantOn, abs_targetJacobianSign

Used by in this Project: integral_det_fderiv_eq_signed_volume

[Read exact source](#)

divergence_eq_zero_of_not_mem_carrier

MathlibAnnex.CompactC1VectorField.divergence_eq_zero_of_not_mem_carrier

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: fderiv_eq_zero_of_not_mem_carrier, divergence

Used by in this Project: support_divergence_subset

[Read exact source](#)

norm_det_sub_le

MathlibAnnex.ContinuousLinearMap.norm_det_sub_le

Proposition or proof step

Route / section: R03

Immediate prerequisites in this Project: abs_det_sub_le

Used by in this Project: tendsto_integral_det_of_strongLn, integrableOn_maximalMinor_fderiv_of_lipschitzWith

[Read exact source](#)

selectedOutput

MathlibAnnex.ContinuousLinearMap.selectedOutput

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: norm_selectedOutputLinearMap_le

Used by in this Project: norm_selectedOutput_le_one, selectedOutput_apply, selectedSquare, selectedSquareCLM, selectedOutput_hasCompactSupport

[Read exact source](#)

coordinateRow

MathlibAnnex.DeterminantFrame.coordinateRow

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateScale

Used by in this Project: coordinateFrame, coordinateRow_apply

[Read exact source](#)

coordinateScale_pos

MathlibAnnex.DeterminantFrame.coordinateScale_pos

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateRowSize_nonneg, coordinateScale

Used by in this Project: coordinateFrame_mem

[Read exact source](#)

exists_maximizingFrame

MathlibAnnex.DeterminantFrame.exists_maximizingFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameDeterminant_continuous, unitFrameSet_isCompact, unitFrameSet_nonempty

Used by in this Project: maximizingFrame

[Read exact source](#)

replacementDeterminant_eq_cramerTranspose

MathlibAnnex.DeterminantFrame.replacementDeterminant_eq_cramerTranspose

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameMatrix_replaceRow, replacementDeterminant

Used by in this Project: cramerReplacement

[Read exact source](#)

closedUnitBall_isCompact

MathlibAnnex.EquivalentSeminorm.isCompact_closedUnitBall

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBall_isBounded

Used by in this Project: closedUnitBallVolume_pos, derivativeGenerator_integrable_of_seminormLipschitz, measure_image_unitBall_eq, radialExtension_integral_abs_det

[Read exact source](#)

spherelsometryEquiv

MathlibAnnex.EquivalentSeminorm.spherelsometryEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: dist_space_eq, unitSphereEquiv

Used by in this Project: linearIsometryEquiv_of_coordinate_model

[Read exact source](#)

configurationFinMap_apply_base

MathlibAnnex.FiniteSup.Bridge.configurationFinMap_apply_base

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap

Used by in this Project: finMapConfiguration_configurationFinMap, pluckerPairing_satelliteCoefficients_maximalMinors

[Read exact source](#)

configurationFinMap_apply_satellite

MathlibAnnex.FiniteSup.Bridge.configurationFinMap_apply_satellite

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap

Used by in this Project: finMapConfiguration_configurationFinMap, pluckerPairing_satelliteCoefficients_maximalMinors

[Read exact source](#)

configurationFinMap_finMapConfiguration

MathlibAnnex.FiniteSup.Bridge.configurationFinMap_finMapConfiguration

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap, finMapConfiguration

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer

[Read exact source](#)

configurationFinMap_norm

MathlibAnnex.FiniteSup.Bridge.configurationFinMap_norm

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap

Used by in this Project: configurationFinMap_norm_le_model

[Read exact source](#)

MaximalMinorsProportional

MathlibAnnex.Matrix.MaximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: maximalMinor

Used by in this Project: orientedMaximalMinor_eq_of_orderEmbedding

[Read exact source](#)

existsUnique_factor_of_orientedMaximalMinorsProportional

MathlibAnnex.Matrix.existsUnique_factor_of_orientedMaximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: chartFactor_unique, det_chartFactor, mul_chartFactor_eq_of_orientedMaximalMinorsProportional

Used by in this Project: None in this Project

[Read exact source](#)

maximalMinor_mul

MathlibAnnex.Matrix.maximalMinor_mul

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor, maximalSubmatrix_mul

Used by in this Project: maximalMinors_mul, derivativeGenerator_comp_linear_apply, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

maximalMinor_ofOrderEmbedding

MathlibAnnex.Matrix.maximalMinor_ofOrderEmbedding

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor, maximalSubmatrix_ofOrderEmbedding

Used by in this Project: frameMap_injective_of_det_ne_zero, orientedMaximalMinor_eq_of_orderEmbedding, pluckerPairing_satelliteCoefficients_maximalMinors

[Read exact source](#)

maximalMinor_zero_of_pos

MathlibAnnex.Matrix.maximalMinor_zero_of_pos

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor, maximalSubmatrix_zero

Used by in this Project: maximalMinors_zero_of_pos

[Read exact source](#)

maximalMinors

MathlibAnnex.Matrix.maximalMinors

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor

Used by in this Project: ballVolumeScaledMaximalMinors, maximalMinors_continuous, maximalMinors_mul, maximalMinors_smul, maximalMinors_zero_of_pos, pluckerPairing_satelliteCoefficients_maximalMinors

[Read exact source](#)

mulVec_injective_of_maximalMinor_ne_zero

MathlibAnnex.Matrix.mulVec_injective_of_maximalMinor_ne_zero

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor, maximalSubmatrix_mulVec

Used by in this Project: frameMap_injective_of_det_ne_zero, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

tendsto_eLpNorm_fderiv_mollify_sub

MathlibAnnex.Mollification.tendsto_eLpNorm_fderiv_mollify_sub

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: eventually_mollify_fderiv_memLpOn_compact

Used by in this Project: tendsto_integral_maximalMinor_mollify

[Read exact source](#)

maxSlice_nonempty

MathlibAnnex.NonemptyCompacts.maxSlice_nonempty

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: maximizer_mem_maxSlice

Used by in this Project: refine

[Read exact source](#)

sum_hessianCoordinate_twoRowReplacement_eq_zero

MathlibAnnex.Piola.sum_hessianCoordinate_twoRowReplacement_eq_zero

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: hessianCoordinate_comm, sum_hessian_twoRowReplacement_eq_zero

Used by in this Project: piola_divergence_eq_zero_of_expansion

[Read exact source](#)

support_componentFlux_subset

MathlibAnnex.Piola.support_componentFlux_subset

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: componentFlux

Used by in this Project: componentFlux_hasCompactSupport

[Read exact source](#)

satellitePolynomial

MathlibAnnex.Satellite.satellitePolynomial

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: replacementDeterminant

Used by in this Project: abs_satellitePolynomial_le, configurationPolynomial

[Read exact source](#)

radialExtension_lipschitz

MathlibAnnex.Sphere.lipschitzWith_radialExtension

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_norm, scaled_normalize_dist_le_two

Used by in this Project: derivativeAverage_comp_linear_radial_apply, finrank_eq, radialExtension_symm_lipschitz, radialExtension_integral_abs_det

[Read exact source](#)

radialExtension_leftInverse

MathlibAnnex.Sphere.radialExtension_leftInverse

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_norm

Used by in this Project: derivativeAverage_comp_linear_radial, radialExtension_image_ball, radialExtension_rightInverse

[Read exact source](#)

compactLocalization_integrable

MathlibAnnex.WeakGradient.integrable_compactLocalization

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier_measurable, compactLocalization, integrableOn_localBallCarrier

Used by in this Project: compactLocalization_locallyIntegrable

[Read exact source](#)

localBall_inner_measure_pos

MathlibAnnex.WeakGradient.localBall_inner_measure_pos

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: inner_nonempty, inner_isOpen

Used by in this Project: exists_inner_convergencePoint

[Read exact source](#)

translatedBumpField_carrier_subset

MathlibAnnex.WeakGradient.translatedBumpField_carrier_subset

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: carrier, middle_subset_open, translated_closedBall_subset_middle, shrinkingBump_rOut_le_half, translatedBumpField

Used by in this Project: weakIntegral_eq_localized_bumpIntegral

[Read exact source](#)

exists_aeConstantOn_of_local

MathlibAnnex.exists_aeConstantOn_of_local

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: aeConstantOn_of_everywhere_local, constantRegion_eq_of_preconnected

Used by in this Project: exists_aeConstantOn_of_local_preconnected

[Read exact source](#)

Level 5

signed_area_transfer

MathlibAnnex.BilipschitzOrientation.signed_area_transfer

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_domainJacobianSign, det_eq_domainSign_mul_abs, targetJacobianSign, target_exceptional_null

Used by in this Project: targetJacobianSign_weakDivergenceZero

[Read exact source](#)

support_divergence_subset

MathlibAnnex.CompactC1VectorField.support_divergence_subset

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: divergence_eq_zero_of_not_mem_carrier

Used by in this Project: None in this Project

[Read exact source](#)

norm_selectedOutput_le_one

MathlibAnnex.ContinuousLinearMap.norm_selectedOutput_le_one

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput

Used by in this Project: norm_selectedSquare_le

[Read exact source](#)

selectedOutput_apply

MathlibAnnex.ContinuousLinearMap.selectedOutput_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput

Used by in this Project: None in this Project

[Read exact source](#)

selectedSquare

MathlibAnnex.ContinuousLinearMap.selectedSquare

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput

Used by in this Project: det_selectedSquare, norm_selectedSquare_le, selectedSquareCLM_apply, selectedSquare_sub, maximalMinorIntegrand

[Read exact source](#)

selectedSquareCLM

MathlibAnnex.ContinuousLinearMap.selectedSquareCLM

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput

Used by in this Project: selectedSquareCLM_apply, selectedSquare_sub, integrableOn_maximalMinor_fderiv_of_lipschitzWith

[Read exact source](#)

coordinateFrame

MathlibAnnex.DeterminantFrame.coordinateFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: Frame, coordinateRow

Used by in this Project: coordinateFrame_mem, frameMatrix_coordinateFrame

[Read exact source](#)

coordinateRow_apply

MathlibAnnex.DeterminantFrame.coordinateRow_apply

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateRow

Used by in this Project: abs_inverse_mulVec_apply_le, frameMatrix_coordinateFrame

[Read exact source](#)

frameMap_injective_of_det_ne_zero

MathlibAnnex.DeterminantFrame.frameMap_injective_of_det_ne_zero

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameCoordinates_eq_mulVec, frameDeterminant, frameMap, maximalMinor_ofOrderEmbedding, mulVec_injective_of_maximalMinor_ne_zero

Used by in this Project: None in this Project

[Read exact source](#)

maximizingFrame

MathlibAnnex.DeterminantFrame.maximizingFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: exists_maximizingFrame

Used by in this Project: abs_frameDeterminant_le_maximizingFrame, determinantMaximum, maximizingFrame_mem

[Read exact source](#)

cramerReplacement

MathlibAnnex.DeterminantFrame.sum_mul_replacementDeterminant

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: functional_apply_eq_sum, replacementDeterminant_eq_cramerTranspose

Used by in this Project: abs_inverse_mulVec_apply_le, absoluteMaximizer_satellite_norms_preimage

[Read exact source](#)

closedUnitBallVolume_pos

MathlibAnnex.EquivalentSeminorm.closedUnitBallVolume_pos

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume, closedUnitBall_isCompact, zero_mem_interior_closedUnitBall

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, derivativeAverage_comp_linear_radial_apply, derivativeAverage_mem_body

[Read exact source](#)

configurationFinMap_norm_le_model

MathlibAnnex.FiniteSup.Bridge.configurationFinMap_norm_le_model

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap_norm, configurationMap_norm_le_model

Used by in this Project: configuration_contraction_iff

[Read exact source](#)

finMapConfiguration_configurationFinMap

MathlibAnnex.FiniteSup.Bridge.finMapConfiguration_configurationFinMap

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap_apply_base, configurationFinMap_apply_satellite, finMapConfiguration

Used by in this Project: configuration_contraction_iff

[Read exact source](#)

ballVolumeScaledMaximalMinors

MathlibAnnex.Matrix.ballVolumeScaledMaximalMinors

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume, maximalMinors

Used by in this Project: PluckerGeneratorGood, ballVolumeScaledMaximalMinors_zero_of_pos, ballVolumeScaledMaximalMinors_continuous, pairing_ballVolumeScaledMaximalMinors, derivativeGenerator, generators

[Read exact source](#)

maximalMinors_continuous

MathlibAnnex.Matrix.continuous_maximalMinors

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinors

Used by in this Project: ballVolumeScaledMaximalMinors_continuous

[Read exact source](#)

maximalMinors_mul

MathlibAnnex.Matrix.maximalMinors_mul

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor_mul, maximalMinors

Used by in this Project: None in this Project

[Read exact source](#)

maximalMinors_smul

MathlibAnnex.Matrix.maximalMinors_smul

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinors

Used by in this Project: None in this Project

[Read exact source](#)

maximalMinors_zero_of_pos

MathlibAnnex.Matrix.maximalMinors_zero_of_pos

Determinant or plucker component

Route / section: R03

Immediate prerequisites in this Project: maximalMinor_zero_of_pos, maximalMinors

Used by in this Project: ballVolumeScaledMaximalMinors_zero_of_pos

[Read exact source](#)

orientedMaximalMinor_eq_of_orderEmbedding

MathlibAnnex.Matrix.orientedMaximalMinor_eq_of_orderEmbedding

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: MaximalMinorsProportional, maximalMinor_ofOrderEmbedding, orientedMaximalMinor

Used by in this Project: orientedMaximalMinorsProportional_of_maximalMinorsProportional

[Read exact source](#)

tendsto_integral_det_of_strongLn

MathlibAnnex.MeasureTheory.tendsto_integral_det_of_strongLn

Measure or volume result

Route / section: R04

Immediate prerequisites in this Project: norm_det_sub_le, StrongLnOperatorField

Used by in this Project: tendsto_integral_maximalMinor_mollify

[Read exact source](#)

refine

MathlibAnnex.NonemptyCompacts.refine

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: maxSlice_isCompact, maxSlice_nonempty

Used by in this Project: mem_refine, lexicographicRefine, refine_convexHull_eq

[Read exact source](#)

selectedOutput_hasCompactSupport

MathlibAnnex.NullLagrangian.hasCompactSupport_selectedOutput

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

componentFlux_hasCompactSupport

MathlibAnnex.Piola.hasCompactSupport_componentFlux

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: support_componentFlux_subset

Used by in this Project: integral_det_singleOutputPerturb_sub_eq_zero

[Read exact source](#)

piola_divergence_eq_zero_of_expansion

MathlibAnnex.Piola.piola_divergence_eq_zero_of_expansion

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: cofactorRowField, sum_hessianCoordinate_twoRowReplacement_eq_zero

Used by in this Project: divergence_cofactorRowField_eq_zero

[Read exact source](#)

measure_image_unitBall_eq

MathlibAnnex.PluckerRecovery.LimitCertificate.measure_image_unitBall_eq

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume, closedUnitBall_isCompact, LimitCertificate

Used by in this Project: image_unitBall_eq

[Read exact source](#)

configurationPolynomial

MathlibAnnex.Satellite.configurationPolynomial

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: SatelliteConfiguration, satellitePolynomial

Used by in this Project: orientedSatelliteSupport, pluckerPairing_satelliteCoefficients_maximalMinors, absoluteMaximizer_base_nearMax, absoluteMaximizer_satellite_norms_preimage, maxSatelliteConfiguration

[Read exact source](#)

radialExtension_symm_lipschitz

MathlibAnnex.Sphere.lipschitzWith_radialExtension_symm

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_lipschitz

Used by in this Project: radialExtensionHomeomorph

[Read exact source](#)

radialExtension_image_ball

MathlibAnnex.Sphere.radialExtension_image_ball

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: Space, eq_zero_of_apply_eq_zero, radialExtension_leftInverse

Used by in this Project: radialExtension_integral_abs_det

[Read exact source](#)

radialExtension_rightInverse

MathlibAnnex.Sphere.radialExtension_rightInverse

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_leftInverse

Used by in this Project: radialExtensionEquiv, radialExtension_surjective

[Read exact source](#)

compactLocalization_locallyIntegrable

MathlibAnnex.WeakGradient.locallyIntegrable_compactLocalization

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: compactLocalization_integrable

Used by in this Project: localMollification_contDiff, exists_inner_convergencePoint, localMollification_fderiv_apply_eq_zero

[Read exact source](#)

weakIntegral_eq_localized_bumpIntegral

MathlibAnnex.WeakGradient.weakIntegral_eq_localized_bumpIntegral

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: fderiv_eq_zero_of_not_mem_carrier, WeakDivergenceZero, compactLocalization, translatedBumpField_carrier_subset

Used by in this Project: localMollification_fderiv_apply_eq_zero

[Read exact source](#)

exists_aeConstantOn_of_local_preconnected

MathlibAnnex.exists_aeConstantOn_of_local_preconnected

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: exists_aeConstantOn_of_local

Used by in this Project: exists_aeConstantOn

[Read exact source](#)

Level 6

det_selectedSquare

MathlibAnnex.ContinuousLinearMap.det_selectedSquare

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedSquare, maximalMinor

Used by in this Project: topMinor_difference_eq_zero_of_not_mem_tsupport

[Read exact source](#)

norm_selectedSquare_le

MathlibAnnex.ContinuousLinearMap.norm_selectedSquare_le

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: norm_selectedOutput_le_one, selectedSquare

Used by in this Project: tendsto_integral_maximalMinor_mollify

[Read exact source](#)

selectedSquareCLM_apply

MathlibAnnex.ContinuousLinearMap.selectedSquareCLM_apply

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedSquare, selectedSquareCLM

Used by in this Project: maximalMinorIntegrand_mollify_continuous

[Read exact source](#)

selectedSquare_sub

MathlibAnnex.ContinuousLinearMap.selectedSquare_sub

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedSquare, selectedSquareCLM

Used by in this Project: tendsto_integral_maximalMinor_mollify

[Read exact source](#)

abs_frameDeterminant_le_maximizingFrame

MathlibAnnex.DeterminantFrame.abs_frameDeterminant_le_maximizingFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: maximizingFrame

Used by in this Project: abs_replacementDeterminant_le_maximum, determinantMaximum_pos

[Read exact source](#)

coordinateFrame_mem

MathlibAnnex.DeterminantFrame.coordinateFrame_mem

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateFrame, coordinateScale_pos, mem_unitFrameSet, norm_rawCoordinateRow_le_size

Used by in this Project: abs_inverse_mulVec_apply_le, determinantMaximum_pos

[Read exact source](#)

determinantMaximum

MathlibAnnex.DeterminantFrame.determinantMaximum

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: maximizingFrame

Used by in this Project: abs_replacementDeterminant_le_maximum, coordinateInverseFactor, determinantMaximum_pos, nearMaxFrames, CoefficientDetectsUnit, satelliteBudget

[Read exact source](#)

frameMatrix_coordinateFrame

MathlibAnnex.DeterminantFrame.frameMatrix_coordinateFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateFrame, coordinateRow_apply, frameMatrix

Used by in this Project: frameDeterminant_coordinateFrame

[Read exact source](#)

maximizingFrame_mem

MathlibAnnex.DeterminantFrame.maximizingFrame_mem

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: maximizingFrame

Used by in this Project: nearMaxFrames_nonempty, absoluteMaximizer_base_nearMax

[Read exact source](#)

PluckerGeneratorGood

MathlibAnnex.FiniteRecovery.PluckerGeneratorGood

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: IsContraction, FinMapAlmostIsometric, ballVolumeScaledMaximalMinors

Used by in this Project: targetRawSupportMaximizer_good

[Read exact source](#)

configuration_contraction_iff

MathlibAnnex.FiniteSup.Bridge.configuration_contraction_iff

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationFinMap_norm_le_model, finMapConfiguration_configurationFinMap, finMapConfiguration_mem

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer

[Read exact source](#)

ballVolumeScaledMaximalMinors_zero_of_pos

MathlibAnnex.Matrix.ballVolumeScaledMaximalMinors_zero_of_pos

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors, maximalMinors_zero_of_pos

Used by in this Project: None in this Project

[Read exact source](#)

ballVolumeScaledMaximalMinors_continuous

MathlibAnnex.Matrix.continuous_ballVolumeScaledMaximalMinors

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors, maximalMinors_continuous

Used by in this Project: derivativeGenerator_integrableOn_compact, generators_isCompact

[Read exact source](#)

orientedMaximalMinorsProportional_of_maximalMinorsProportional

MathlibAnnex.Matrix.orientedMaximalMinorsProportional_of_maximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: OrientedMaximalMinorsProportional, exists_orderEmbedding_perm_of_injective, orientedMaximalMinor_eq_of_orderEmbedding, orientedMaximalMinor_eq_zero_of_not_injective, orientedMaximalMinor_permute

Used by in this Project: mul_chartFactor_eq_of_maximalMinorsProportional

[Read exact source](#)

pairing_ballVolumeScaledMaximalMinors

MathlibAnnex.Matrix.pairing_ballVolumeScaledMaximalMinors

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors

Used by in this Project: pluckerFunctional_normalized_configurationFinMap

[Read exact source](#)

mem_refine

MathlibAnnex.NonemptyCompacts.mem_refine

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: refine

Used by in this Project: lexicographicRefine_subset

[Read exact source](#)

maximalMinorIntegrand

MathlibAnnex.NullLagrangian.maximalMinorIntegrand

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedSquare

Used by in this Project: maximalMinorIntegrand_mollify_continuous, integrableOn_maximalMinor_fderiv_of_lipschitzWith, integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff, tendsto_integral_maximalMinor_mollify, topMinor_difference_eq_zero_of_not_mem_tsupport

[Read exact source](#)

divergence_cofactorRowField_eq_zero

MathlibAnnex.Piola.divergence_cofactorRowField_eq_zero

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: basisRow_apply, piola_divergence_eq_zero_of_expansion

Used by in this Project: divergence_componentFlux_eq_det_sub

[Read exact source](#)

derivativeGenerator

MathlibAnnex.Plucker.derivativeGenerator

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors

Used by in this Project: derivativeAverage, derivativeGenerator_comp_linear_apply, derivativeGenerator_mem_raw, derivativeGenerator_integrableOn_compact

[Read exact source](#)

generators

MathlibAnnex.PluckerBody.generators

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: IsContraction, ballVolumeScaledMaximalMinors

Used by in this Project: derivativeGenerator_mem_raw, body, generators_eq_image_union, generators_neg, generators_nonempty

[Read exact source](#)

image_unitBall_eq

MathlibAnnex.PluckerRecovery.LimitCertificate.image_unitBall_eq

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: measure_image_unitBall_eq, measure_lt

Used by in this Project: exists_linearIsometryEquiv_of_pluckerBodies_eq

[Read exact source](#)

orientedSatelliteSupport

MathlibAnnex.PluckerSupport.orientedSatelliteSupport

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: satellitePluckerCoefficients, configurationPolynomial

Used by in this Project: orientedSatelliteSupport_configuration

[Read exact source](#)

pluckerPairing_satelliteCoefficients_maximalMinors

MathlibAnnex.PluckerSupport.pluckerPairing_satelliteCoefficients_maximalMinors

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: frameMatrix_replaceRow, configurationFinMap_apply_base, configurationFinMap_apply_satellite, maximalMinor_ofOrderEmbedding, maximalMinors, satellitePluckerCoefficients, configurationPolynomial

Used by in this Project: pluckerFunctional_normalized_configurationFinMap

[Read exact source](#)

maxSatelliteConfiguration

MathlibAnnex.Satellite.maxSatelliteConfiguration

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: frameDeterminant_continuous, configurationPolynomial, satelliteConfigurationSet

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, maxNetConfigurationMap_lower_of_ne_zero, exists_goodNetSatelliteMaximizer

[Read exact source](#)

radialExtensionEquiv

MathlibAnnex.Sphere.radialExtensionEquiv

Rigidity or equivalence result

Route / section: R01

Immediate prerequisites in this Project: radialExtension_rightInverse

Used by in this Project: radialExtensionHomeomorph

[Read exact source](#)

radialExtension_surjective

MathlibAnnex.Sphere.radialExtension_surjective

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_rightInverse

Used by in this Project: finrank_eq

[Read exact source](#)

localMollification_contDiff

MathlibAnnex.WeakGradient.contDiff_localMollification

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: localMollification, compactLocalization_locallyIntegrable

Used by in this Project: exists_localMollification_constant

[Read exact source](#)

exists_inner_convergencePoint

MathlibAnnex.WeakGradient.exists_inner_convergencePoint

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: localMollification_tendsto_ae, localBall_inner_measure_pos, compactLocalization_locallyIntegrable

Used by in this Project: compactLocalization_aeConstant_inner

[Read exact source](#)

localMollification_fderiv_apply_eq_zero

MathlibAnnex.WeakGradient.localMollification_fderiv_apply_eq_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: divergence_translatedBumpField, localMollification_fderiv_apply, compactLocalization_locallyIntegrable, weakIntegral_eq_localized_bumpIntegral

Used by in this Project: localMollification_fderiv_eq_zero

[Read exact source](#)

lexicographicRefine

MathlibAnnex.lexicographicRefine

Mathematical construction

Route / section: R02

Immediate prerequisites in this Project: refine

Used by in this Project: lexicographicRefine_convexHull_eq, lexicographicRefine_subset

[Read exact source](#)

refine_convexHull_eq

MathlibAnnex.refine_convexHull_eq

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: refine, convexHull_maxSlice_eq_supportFace, maxValue_eq_of_convexHull_eq

Used by in this Project: lexicographicRefine_convexHull_eq

[Read exact source](#)

Level 7

abs_replacementDeterminant_le_maximum

MathlibAnnex.DeterminantFrame.abs_replacementDeterminant_le_maximum

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: abs_frameDeterminant_le_maximizingFrame, determinantMaximum, replaceRow_mem_unitFrameSet, replacementDeterminant

Used by in this Project: abs_cramerNumerator_le, abs_satelliteTerms_le_budget

[Read exact source](#)

coordinateInverseFactor

MathlibAnnex.DeterminantFrame.coordinateInverseFactor

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateScale, determinantMaximum

Used by in this Project: inverseBoundConstant

[Read exact source](#)

frameDeterminant_coordinateFrame

MathlibAnnex.DeterminantFrame.frameDeterminant_coordinateFrame

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameDeterminant, frameMatrix_coordinateFrame

Used by in this Project: determinantMaximum_pos

[Read exact source](#)

nearMaxFrames

MathlibAnnex.DeterminantFrame.nearMaxFrames

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: determinantMaximum

Used by in this Project: bound_sub, nearMaxFrames_isCompact, nearMaxFrame_abs_det_lower, nearMaxFrames_nonempty

[Read exact source](#)

mul_chartFactor_eq_of_maximalMinorsProportional

MathlibAnnex.Matrix.mul_chartFactor_eq_of_maximalMinorsProportional

Determinant or plucker component

Route / section: R09

Immediate prerequisites in this Project: mul_chartFactor_eq_of_orientedMaximalMinorsProportional, orientedMaximalMinorsProportional_of_maximalMinorsProportional

Used by in this Project: exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

maximalMinorIntegrand_mollify_continuous

MathlibAnnex.NullLagrangian.continuous_maximalMinorIntegrand_mollify

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedSquareCLM_apply, mollify_contDiff, maximalMinorIntegrand

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

integrableOn_maximalMinor_fderiv_of_lipschitzWith

MathlibAnnex.NullLagrangian.integrableOn_maximalMinor_fderiv_of_lipschitzWith

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: norm_det_sub_le, selectedSquareCLM, lipschitz_fderiv_memLpOn_compact, maximalMinorIntegrand

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith, radialExtension_integral_abs_det

[Read exact source](#)

tendsto_integral_maximalMinor_mollify

MathlibAnnex.NullLagrangian.tendsto_integral_maximalMinor_mollify

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: norm_selectedSquare_le, selectedSquare_sub, tendsto_integral_det_of_strongLn, lipschitz_fderiv_memLpOn_compact, tendsto_eLpNorm_fderiv_mollify_sub, maximalMinorIntegrand

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

topMinor_difference_eq_zero_of_not_mem_tsupport

MathlibAnnex.NullLagrangian.topMinor_difference_eq_zero_of_not_mem_tsupport

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: det_selectedSquare, maximalMinorIntegrand

Used by in this Project: integral_topMinor_difference_eq_setIntegral

[Read exact source](#)

divergence_componentFlux_eq_det_sub

MathlibAnnex.Piola.divergence_componentFlux_eq_det_sub

Proposition or proof step

Route / section: R04

Immediate prerequisites in this Project: componentFlux, det_updateRow_eq_sum_mul_cofactorRow, divergence_cofactorRowField_eq_zero, singleOutputPerturb

Used by in this Project: integral_det_singleOutputPerturb_sub_eq_zero

[Read exact source](#)

derivativeAverage

MathlibAnnex.Plucker.derivativeAverage

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: derivativeGenerator

Used by in this Project: derivativeAverage_comp_linear_radial_apply, derivativeAverage_mem_body

[Read exact source](#)

derivativeGenerator_comp_linear_apply

MathlibAnnex.Plucker.derivativeGenerator_comp_linear_apply

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: maximalMinor_mul, derivativeGenerator

Used by in this Project: derivativeAverage_comp_linear_radial_apply

[Read exact source](#)

derivativeGenerator_mem_raw

MathlibAnnex.Plucker.derivativeGenerator_mem_raw

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: derivativeGenerator, generators

Used by in this Project: derivativeAverage_mem_body, derivativeGenerator_integrable_of_seminormLipschitz

[Read exact source](#)

derivativeGenerator_integrableOn_compact

MathlibAnnex.Plucker.integrableOn_derivativeGenerator_compact

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors_continuous, derivativeGenerator

Used by in this Project: derivativeAverage_comp_linear_radial_apply

[Read exact source](#)

body

MathlibAnnex.PluckerBody.body

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: generators

Used by in this Project: exists_almostIsometryMatch_at_satelliteDimension, derivativeAverage_mem_body, body_neg, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

generators_eq_image_union

MathlibAnnex.PluckerBody.generators_eq_image_union

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: contractionSet, generators

Used by in this Project: generators_isCompact

[Read exact source](#)

generators_neg

MathlibAnnex.PluckerBody.generators_neg

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: generators

Used by in this Project: body_neg

[Read exact source](#)

generators_nonempty

MathlibAnnex.PluckerBody.generators_nonempty

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: zero_isContraction, generators

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer

[Read exact source](#)

pluckerFunctional_normalized_configurationFinMap

MathlibAnnex.PluckerSupport.pluckerFunctional_normalized_configurationFinMap

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: pairing_ballVolumeScaledMaximalMinors, pluckerPairing_satelliteCoefficients_maximalMinors

Used by in this Project: orientedSatelliteSupport_configuration

[Read exact source](#)

CoefficientDetectsUnit

MathlibAnnex.Satellite.CoefficientDetectsUnit

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: NearMaxInverseBound, determinantMaximum, Space, eq_zero_of_apply_eq_zero

Used by in this Project: absoluteMaximizer_satellites_almost_norm, finiteCoefficientNet_detectsUnit

[Read exact source](#)

satelliteBudget

MathlibAnnex.Satellite.satelliteBudget

Mathematical construction

Route / section: Project-wide support

Immediate prerequisites in this Project: determinantMaximum, Space, eq_zero_of_apply_eq_zero

Used by in this Project: abs_satelliteTerms_le_budget, exists_weight_dominating_budget

[Read exact source](#)

finrank_eq

MathlibAnnex.Sphere.finrank_eq

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtension_lipschitz, radialExtension_surjective

Used by in this Project: linearIsometryEquiv_of_isometryEquiv_finiteDimensional

[Read exact source](#)

radialExtensionHomeomorph

MathlibAnnex.Sphere.radialExtensionHomeomorph

Mathematical construction

Route / section: R01

Immediate prerequisites in this Project: radialExtension_symm_lipschitz, radialExtensionEquiv

Used by in this Project: finiteDimensional_codomain

[Read exact source](#)

localMollification_fderiv_eq_zero

MathlibAnnex.WeakGradient.localMollification_fderiv_eq_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: localMollification_fderiv_apply_eq_zero

Used by in this Project: exists_localMollification_constant

[Read exact source](#)

lexicographicRefine_convexHull_eq

MathlibAnnex.lexicographicRefine_convexHull_eq

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: lexicographicRefine, refine_convexHull_eq

Used by in this Project: exists_common_of_convexHull_eq

[Read exact source](#)

lexicographicRefine_subset

MathlibAnnex.lexicographicRefine_subset

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: mem_refine, lexicographicRefine

Used by in this Project: lexicographicRefine_agreesOn

[Read exact source](#)

Level 8

bound_sub

MathlibAnnex.DeterminantFrame.NearMaxInverseBound.bound_sub

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: NearMaxInverseBound, coordinateEquiv, nearMaxFrames

Used by in this Project: None in this Project

[Read exact source](#)

abs_cramerNumerator_le

MathlibAnnex.DeterminantFrame.abs_cramerNumerator_le

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: abs_replacementDeterminant_le_maximum

Used by in this Project: abs_inverse_mulVec_apply_le

[Read exact source](#)

determinantMaximum_pos

MathlibAnnex.DeterminantFrame.determinantMaximum_pos

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: abs_frameDeterminant_le_maximizingFrame, coordinateFrame_mem, determinantMaximum, frameDeterminant_coordinateFrame

Used by in this Project: inverseBoundConstant_bound, inverseBoundConstant_pos, exists_weight_dominating_budget

[Read exact source](#)

inverseBoundConstant

MathlibAnnex.DeterminantFrame.inverseBoundConstant

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: coordinateInverseFactor, inverseCoordinateMap

Used by in this Project: inverseBoundConstant_bound, inverseBoundConstant_pos

[Read exact source](#)

nearMaxFrames_isCompact

MathlibAnnex.DeterminantFrame.isCompact_nearMaxFrames

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: nearMaxFrames

Used by in this Project: None in this Project

[Read exact source](#)

nearMaxFrame_abs_det_lower

MathlibAnnex.DeterminantFrame.nearMaxFrame_abs_det_lower

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: nearMaxFrames

Used by in this Project: nearMaxFrame_det_ne_zero

[Read exact source](#)

nearMaxFrames_nonempty

MathlibAnnex.DeterminantFrame.nearMaxFrames_nonempty

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: maximizingFrame_mem, nearMaxFrames

Used by in this Project: None in this Project

[Read exact source](#)

integral_topMinor_difference_eq_setIntegral

MathlibAnnex.NullLagrangian.integral_topMinor_difference_eq_setIntegral

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: topMinor_difference_eq_zero_of_not_mem_tsupport

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

integral_det_singleOutputPerturb_sub_eq_zero

MathlibAnnex.Piola.integral_det_singleOutputPerturb_sub_eq_zero

Measure or volume result

Route / section: R04

Immediate prerequisites in this Project: divergence_componentFlux_eq_det_sub, componentFlux_hasCompactSupport, integral_coordinateDivergence_eq_zero_of_contDiff_hasCompactSupport

Used by in this Project: integral_det_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

derivativeAverage_comp_linear_radial_apply

MathlibAnnex.Plucker.derivativeAverage_comp_linear_radial_apply

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume_pos, dist_space_eq, derivativeAverage, derivativeGenerator_comp_linear_apply, derivativeGenerator_integrableOn_compact, radialExtension_lipschitz

Used by in this Project: derivativeAverage_comp_linear_radial

[Read exact source](#)

body_neg

MathlibAnnex.PluckerBody.body_neg

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: body, generators_neg

Used by in this Project: normalizedGenerator_mem_of_spherelsometry

[Read exact source](#)

generators_isCompact

MathlibAnnex.PluckerBody.isCompact_generators

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: ballVolumeScaledMaximalMinors_continuous, generators_eq_image_union

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, derivativeAverage_mem_body, derivativeGenerator_integrable_of_seminormLipschitz

[Read exact source](#)

orientedSatelliteSupport_configuration

MathlibAnnex.PluckerSupport.orientedSatelliteSupport_configuration

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: orientedSatelliteSupport, pluckerFunctional_normalized_configurationFinMap

Used by in this Project: orientedSatelliteSupport_self

[Read exact source](#)

abs_satelliteTerms_le_budget

MathlibAnnex.Satellite.abs_satelliteTerms_le_budget

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_replacementDeterminant_le_maximum, satelliteBudget

Used by in this Project: abs_satellitePolynomial_le

[Read exact source](#)

finiteDimensional_codomain

MathlibAnnex.Sphere.finiteDimensional_codomain

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: radialExtensionHomeomorph

Used by in this Project: finiteDimensional_domain, linearIsometryEquiv_of_isometryEquiv_finiteDimensional_domain

[Read exact source](#)

radialExtension_integral_abs_det

MathlibAnnex.Sphere.radialExtension_integral_abs_det

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: volume_image_eq_zero_of_lipschitzWith, closedUnitBallVolume, dist_space_eq, closedUnitBall_isCompact, orderedRows_ofOrderEmbedding, integrableOn_maximalMinor_fderiv_of_lipschitzWith, radialExtension_lipschitz, radialExtension_image_ball

Used by in this Project: None in this Project

[Read exact source](#)

exists_localMollification_constant

MathlibAnnex.WeakGradient.exists_localMollification_constant

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: inner_isOpen, localMollification_contDiff, localMollification_fderiv_eq_zero

Used by in this Project: localMollification_eq_at_inner_points

[Read exact source](#)

lexicographicRefine_agreesOn

MathlibAnnex.apply_eq_of_mem_lexicographicRefine

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: lexicographicRefine_subset

Used by in this Project: lexicographicRefine_subsingleton

[Read exact source](#)

Level 9

inverseBoundConstant_pos

MathlibAnnex.DeterminantFrame.inverseBoundConstant_pos

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: determinantMaximum_pos, inverseBoundConstant

Used by in this Project: exists_nearMaxInverseBound

[Read exact source](#)

nearMaxFrame_det_ne_zero

MathlibAnnex.DeterminantFrame.nearMaxFrame_det_ne_zero

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: nearMaxFrame_abs_det_lower

Used by in this Project: abs_inverse_mulVec_apply_le, nearMaxFrame_det_isUnit, absoluteMaximizer_satellite_norms_preimage

[Read exact source](#)

integral_det_fderiv_add_sub_eq_zero_of_contDiff

MathlibAnnex.Piola.integral_det_fderiv_add_sub_eq_zero_of_contDiff

Measure or volume result

Route / section: R04

Immediate prerequisites in this Project: integral_det_singleOutputPerturb_sub_eq_zero, outputHybrid_empty, outputHybrid_insert_eq_singleOutputPerturb, outputHybrid_univ

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff

[Read exact source](#)

derivativeAverage_mem_body

MathlibAnnex.Plucker.derivativeAverage_mem_body

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume_pos, derivativeAverage, derivativeGenerator_mem_raw, body, generators_isCompact, isCompact_convexHull_pi

Used by in this Project: exists_extension_with_derivativeAverage_mem

[Read exact source](#)

derivativeGenerator_integrable_of_seminormLipschitz

MathlibAnnex.Plucker.integrableOn_derivativeGenerator_of_seminormLipschitz

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBall_isCompact, ae_norm_apply_le_seminorm_of_lipschitz, derivativeGenerator_mem_raw, generators_isCompact

Used by in this Project: exists_extension_with_derivativeAverage_mem

[Read exact source](#)

orientedSatelliteSupport_self

MathlibAnnex.PluckerSupport.orientedSatelliteSupport_self

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: orientedSatelliteSupport_configuration

Used by in this Project: rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer

[Read exact source](#)

abs_satellitePolynomial_le

MathlibAnnex.Satellite.abs_satellitePolynomial_le

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_satelliteTerms_le_budget, satellitePolynomial

Used by in this Project: base_mem_nearMax_of_benchmark_le

[Read exact source](#)

exists_weight_dominating_budget

MathlibAnnex.Satellite.exists_weight_dominating_budget

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: determinantMaximum_pos, satelliteBudget

Used by in this Project: exists_goodNetSatelliteMaximizer

[Read exact source](#)

finiteDimensional_domain

MathlibAnnex.Sphere.finiteDimensional_domain

Proposition or proof step

Route / section: R01

Immediate prerequisites in this Project: finiteDimensional_codomain

Used by in this Project: linearIsometryEquiv_of_isometryEquiv_finiteDimensional_codomain

[Read exact source](#)

localMollification_eq_at_inner_points

MathlibAnnex.WeakGradient.localMollification_eq_at_inner_points

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: exists_localMollification_constant

Used by in this Project: compactLocalization_aeConstant_inner

[Read exact source](#)

lexicographicRefine_subsingleton

MathlibAnnex.lexicographicRefine_subsingleton

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: lexicographicRefine_agreesOn

Used by in this Project: exists_common_of_convexHull_eq

[Read exact source](#)

Level 10

abs_inverse_mulVec_apply_le

MathlibAnnex.DeterminantFrame.abs_inverse_mulVec_apply_le

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: abs_cramerNumerator_le, coordinateFrame_mem, coordinateRow_apply, nearMaxFrame_det_ne_zero, cramerReplacement

Used by in this Project: inverseBoundConstant_bound

[Read exact source](#)

nearMaxFrame_det_isUnit

MathlibAnnex.DeterminantFrame.isUnit_nearMaxFrame_det

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: nearMaxFrame_det_ne_zero

Used by in this Project: inverse_mulVec_frameCoordinates

[Read exact source](#)

rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer

MathlibAnnex.FiniteRecovery.exists_contraction_maximizing_abs_configurationPolynomial_of_mem_maxSlice

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: closedUnitBallVolume_pos, configurationFinMap_finMapConfiguration, configuration_contraction_iff, le_maximizer, maxSlice, generators_nonempty, generators_isCompact, orientedSatelliteSupport_self, maxSatelliteConfiguration

Used by in this Project: targetRawSupportMaximizer_good

[Read exact source](#)

integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff

MathlibAnnex.NullLagrangian.integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: selectedOutput_hasCompactSupport, maximalMinorIntegrand, integral_det_fderiv_add_sub_eq_zero_of_contDiff

Used by in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

[Read exact source](#)

exists_extension_with_derivativeAverage_mem

MathlibAnnex.Plucker.exists_extension_with_derivativeAverage_mem

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: dist_space_eq, unitSphere, derivativeAverage_mem_body, derivativeGenerator_integrable_of_seminormLipschitz

Used by in this Project: normalizedGenerator_mem_of_spherelsometry

[Read exact source](#)

absoluteMaximizer_satellite_norms_preimage

MathlibAnnex.Satellite.absoluteMaximizer_satellite_norms_preimage

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: nearMaxFrame_det_ne_zero, cramerReplacement, Space, eq_zero_of_apply_eq_zero, abs_affine_endpoint_rigidity, configurationPolynomial, satelliteConfigurationSet

Used by in this Project: absoluteMaximizer_satellites_almost_norm

[Read exact source](#)

base_mem_nearMax_of_benchmark_le

MathlibAnnex.Satellite.base_mem_nearMax_of_benchmark_le

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: abs_satellitePolynomial_le

Used by in this Project: absoluteMaximizer_base_nearMax

[Read exact source](#)

compactLocalization_aeConstant_inner

MathlibAnnex.WeakGradient.compactLocalization_aeConstant_inner

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: AEConstantOn, exists_inner_convergencePoint, localMollification_eq_at_inner_points

Used by in this Project: exists_aeConstant_inner

[Read exact source](#)

exists_common_of_convexHull_eq

MathlibAnnex.exists_common_of_convexHull_eq

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: lexicographicRefine_convexHull_eq, lexicographicRefine_subsingleton

Used by in this Project: exists_common_pi

[Read exact source](#)

Level 11

inverseBoundConstant_bound

MathlibAnnex.DeterminantFrame.inverseBoundConstant_bound

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: abs_inverse_mulVec_apply_le, determinantMaximum_pos, inverseBoundConstant

Used by in this Project: exists_nearMaxInverseBound

[Read exact source](#)

inverse_mulVec_frameCoordinates

MathlibAnnex.DeterminantFrame.inverse_mulVec_frameCoordinates

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: frameCoordinates_eq_mulVec, nearMaxFrame_det_isUnit

Used by in this Project: frameCoordinates_mem_coefficientAnnulus, modelDist_framePreimage_le

[Read exact source](#)

integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

MathlibAnnex.NullLagrangian.integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: eventually_tsupport_mollify_subset_compact, mollify_add, maximalMinorIntegrand_mollify_continuous, integrableOn_maximalMinor_fderiv_of_lipschitzWith, integral_maximalMinor_fderiv_add_sub_eq_zero_of_contDiff, integral_topMinor_difference_eq_setIntegral, tendsto_integral_maximalMinor_mollify

Used by in this Project: weak_piola, integral_maximalMinor_eq_of_pointwise_boundary_eq

[Read exact source](#)

absoluteMaximizer_base_nearMax

MathlibAnnex.Satellite.absoluteMaximizer_base_nearMax

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: frameMatrix_replaceRow, maximizingFrame_mem, base_mem_nearMax_of_benchmark_le, configurationPolynomial, satelliteConfigurationSet

Used by in this Project: finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

[Read exact source](#)

absoluteMaximizer_satellites_almost_norm

MathlibAnnex.Satellite.absoluteMaximizer_satellites_almost_norm

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: CoefficientDetectsUnit, abs_eval_lower_of_norms_nearby, absoluteMaximizer_satellite_norms_preimage

Used by in this Project: absoluteMaximizer_satellites_one_sub_epsilon

[Read exact source](#)

exists_aeConstant_inner

MathlibAnnex.WeakGradient.exists_aeConstant_inner

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: compactLocalization_aeConstant_inner, compactLocalization_eq_ae_inner

Used by in this Project: exists_localAEConstantAt

[Read exact source](#)

exists_common_pi

MathlibAnnex.exists_common_pi

Proposition or proof step

Route / section: R02

Immediate prerequisites in this Project: allCoordinates_separate, exists_common_of_convexHull_eq

Used by in this Project: exists_almostIsometryMatch_at_satelliteDimension, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

Level 12

weak_piola

MathlibAnnex.BilipschitzOrientation.weak_piola

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: f_injective, contDiff, fderiv_eq_zero_of_not_mem_carrier, carrier_compact, support_subset, orderedRows_ofOrderEmbedding, integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith, divergence_pi

Used by in this Project: targetJacobianSign_weakDivergenceZero

[Read exact source](#)

exists_nearMaxInverseBound

MathlibAnnex.DeterminantFrame.nonempty_nearMaxInverseBound

Determinant or plucker component

Route / section: R07

Immediate prerequisites in this Project: NearMaxInverseBound, inverseBoundConstant_bound, inverseBoundConstant_pos

Used by in this Project: exists_goodSatellitePackage

[Read exact source](#)

integral_maximalMinor_eq_of_pointwise_boundary_eq

MathlibAnnex.NullLagrangian.integral_maximalMinor_eq_of_pointwise_boundary_eq

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: integral_maximalMinor_fderiv_add_sub_eq_zero_of_lipschitzWith

Used by in this Project: normalizedGenerator_mem_of_spherelsometry

[Read exact source](#)

absoluteMaximizer_satellites_one_sub_epsilon

MathlibAnnex.Satellite.absoluteMaximizer_satellites_one_sub_epsilon

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: absoluteMaximizer_satellites_almost_norm

Used by in this Project: finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

[Read exact source](#)

frameCoordinates_mem_coefficientAnnulus

MathlibAnnex.Satellite.frameCoordinates_mem_coefficientAnnulus

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: NearMaxInverseBound, inverse_mulVec_frameCoordinates, Space, eq_zero_of_apply_eq_zero, coefficientAnnulus, frameCoordinates_norm_le_model

Used by in this Project: exists_net_preimage_close

[Read exact source](#)

modelDist_framePreimage_le

MathlibAnnex.Satellite.modelDist_framePreimage_le

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: NearMaxInverseBound, inverse_mulVec_frameCoordinates, Space, eq_zero_of_apply_eq_zero

Used by in this Project: exists_net_preimage_close

[Read exact source](#)

exists_localAEConstantAt

MathlibAnnex.WeakGradient.nonempty_localAEConstantAt

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: LocalAEConstantAt, exists_aeConstant_inner, exists_localBallData

Used by in this Project: locally_aeConstant

[Read exact source](#)

Level 13

targetJacobianSign_weakDivergenceZero

MathlibAnnex.BilipschitzOrientation.weakDivergenceZero_targetJacobianSign

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: signed_area_transfer, weak_piola, WeakDivergenceZero

Used by in this Project: targetJacobianSign_ae_const

[Read exact source](#)

exists_net_preimage_close

MathlibAnnex.Satellite.exists_net_preimage_close

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: K_nonneg, FiniteCoefficientNet, frameCoordinates_mem_coefficientAnnulus, modelDist_framePreimage_le

Used by in this Project: finiteCoefficientNet_detectsUnit

[Read exact source](#)

locally_aeConstant

MathlibAnnex.WeakDivergenceZero.nonempty_localAEConstantAt

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: exists_localAEConstantAt

Used by in this Project: exists_aeConstantOn

[Read exact source](#)

Level 14

finiteCoefficientNet_detectsUnit

MathlibAnnex.Satellite.finiteCoefficientNet_detectsUnit

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: CoefficientDetectsUnit, exists_net_preimage_close

Used by in this Project: finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

[Read exact source](#)

exists_aeConstantOn

MathlibAnnex.WeakDivergenceZero.exists_aeConstantOn

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: locally_aeConstant, exists_aeConstantOn_of_local_preconnected

Used by in this Project: targetJacobianSign_ae_const, exists_eqOn

[Read exact source](#)

Level 15

targetJacobianSign_ae_const

MathlibAnnex.BilipschitzOrientation.targetJacobianSign_ae_const

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: targetJacobianSign_locallyIntegrableOn, targetJacobianSign_weakDivergenceZero, exists_aeConstantOn

Used by in this Project: integral_det_fderiv_eq_signed_volume

[Read exact source](#)

finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

MathlibAnnex.Satellite.finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: absoluteMaximizer_base_nearMax, absoluteMaximizer_satellites_one_sub_epsilon, finiteCoefficientNet_detectsUnit

Used by in this Project: targetRawSupportMaximizer_good, maxNetConfigurationMap_lower_of_ne_zero, exists_goodNetSatelliteMaximizer

[Read exact source](#)

exists_eqOn

MathlibAnnex.WeakDivergenceZero.exists_eqOn

Proposition or proof step

Route / section: R05

Immediate prerequisites in this Project: exists_aeConstantOn

Used by in this Project: None in this Project

[Read exact source](#)

Level 16

integral_det_fderiv_eq_signed_volume

MathlibAnnex.BilipschitzOrientation.integral_det_fderiv_eq_signed_volume

Measure or volume result

Route / section: Project-wide support

Immediate prerequisites in this Project: targetJacobianSign_ae_const, targetJacobianSign_const_is_pm_one

Used by in this Project: derivativeAverage_comp_linear_radial

[Read exact source](#)

targetRawSupportMaximizer_good

MathlibAnnex.FiniteRecovery.targetRawSupportMaximizer_good

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: PluckerGeneratorGood, rawOrientedSupportMaximizer_isAbsolutePolynomialMaximizer, finiteNet_absoluteMaximizer_satellites_one_sub_epsilon

Used by in this Project: exists_almostIsometryMatch_at_satelliteDimension, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

maxNetConfigurationMap_lower_of_ne_zero

MathlibAnnex.FiniteSup.maxNetConfigurationMap_lower_of_ne_zero

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: configurationMap_norm_gt_of_satellite, finiteNet_absoluteMaximizer_satellites_one_sub_epsilon, maxSatelliteConfiguration

Used by in this Project: None in this Project

[Read exact source](#)

exists_goodNetSatelliteMaximizer

MathlibAnnex.Satellite.exists_goodNetSatelliteMaximizer

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: exists_weight_dominating_budget, finiteNet_absoluteMaximizer_satellites_one_sub_epsilon, maxSatelliteConfiguration

Used by in this Project: exists_goodSatellitePackage

[Read exact source](#)

Level 17

exists_almostIsometryMatch_at_satelliteDimension

MathlibAnnex.FiniteRecovery.nonempty_almostIsometryMatch_at_satelliteDimension

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: AlmostIsometryMatch, targetRawSupportMaximizer_good, body, exists_common_pi

Used by in this Project: exists_almostIsometryMatch_of_all_body_eq

[Read exact source](#)

derivativeAverage_comp_linear_radial

MathlibAnnex.Plucker.derivativeAverage_comp_linear_radial

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: integral_det_fderiv_eq_signed_volume, derivativeAverage_comp_linear_radial_apply, radialExtension_leftInverse

Used by in this Project: normalizedGenerator_mem_of_spherelsometry

[Read exact source](#)

exists_goodSatellitePackage

MathlibAnnex.Satellite.exists_goodSatellitePackage

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: exists_nearMaxInverseBound, exists_goodNetSatelliteMaximizer

Used by in this Project: exists_almostIsometryMatch_of_all_body_eq, exists_linearCertificate_of_pluckerBodies_eq

[Read exact source](#)

Level 18

exists_almostIsometryMatch_of_all_body_eq

MathlibAnnex.FiniteRecovery.nonempty_almostIsometryMatch_of_all_body_eq

Proposition or proof step

Route / section: Project-wide support

Immediate prerequisites in this Project: exists_almostIsometryMatch_at_satelliteDimension, exists_goodSatellitePackage

Used by in this Project: None in this Project

[Read exact source](#)

normalizedGenerator_mem_of_spherelsometry

MathlibAnnex.PluckerBody.normalizedGenerator_mem_of_spherelsometry

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: integral_maximalMinor_eq_of_pointwise_boundary_eq, derivativeAverage_comp_linear_radial, exists_extension_with_derivativeAverage_mem, body_neg, radialExtension_on_sphere

Used by in this Project: rawGenerators_subset_of_spherelsometry

[Read exact source](#)

exists_linearCertificate_of_pluckerBodies_eq

MathlibAnnex.PluckerRecovery.nonempty_linearCertificate_of_pluckerBodies_eq

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: targetRawSupportMaximizer_good, lower_of_ne_zero, maximalMinor_mul, mulVec_injective_of_maximalMinor_ne_zero, mul_chartFactor_eq_of_maximalMinorsProportional, body, LinearCertificate, exists_goodSatellitePackage, exists_common_pi

Used by in this Project: exists_limitCertificate_of_pluckerBodies_eq

[Read exact source](#)

Level 19

rawGenerators_subset_of_spherelsometry

MathlibAnnex.PluckerBody.rawGenerators_subset_of_spherelsometry

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: normalizedGenerator_mem_of_spherelsometry

Used by in this Project: subset_of_spherelsometry

[Read exact source](#)

exists_limitCertificate_of_pluckerBodies_eq

MathlibAnnex.PluckerRecovery.nonempty_limitCertificate_of_pluckerBodies_eq

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: LimitCertificate, referenceNorm_le, exists_linearCertificate_of_pluckerBodies_eq

Used by in this Project: exists_linearIsometryEquiv_of_pluckerBodies_eq

[Read exact source](#)

Level 20

exists_linearIsometryEquiv_of_pluckerBodies_eq

MathlibAnnex.EquivalentSeminorm.nonempty_linearIsometryEquiv_of_pluckerBodies_eq

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: LinearIsometryEquiv, image_unitBall_eq, exists_limitCertificate_of_pluckerBodies_eq, map_eq

Used by in this Project: linearIsometryEquiv_of_spherelsometryEquiv

[Read exact source](#)

subset_of_spherelsometry

MathlibAnnex.PluckerBody.subset_of_spherelsometry

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: rawGenerators_subset_of_spherelsometry

Used by in this Project: eq_of_spherelsometry

[Read exact source](#)

Level 21

eq_of_spherelsometry

MathlibAnnex.PluckerBody.eq_of_spherelsometry

Determinant or plucker component

Route / section: Project-wide support

Immediate prerequisites in this Project: subset_of_spherelsometry

Used by in this Project: linearIsometryEquiv_of_spherelsometryEquiv

[Read exact source](#)

Level 22

linearIsometryEquiv_of_spherelsometryEquiv

MathlibAnnex.EquivalentSeminorm.nonempty_linearIsometryEquiv_of_spherelsometryEquiv

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: exists_linearIsometryEquiv_of_pluckerBodies_eq, eq_of_spherelsometry

Used by in this Project: linearIsometryEquiv_of_coordinate_model

[Read exact source](#)

Level 23

linearIsometryEquiv_of_coordinate_model

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_coordinate_model

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: linearIsometryEquiv_of_spherelsometryEquiv, spherelsometryEquiv, transportLinearIsometryEquiv

Used by in this Project: linearIsometryEquiv_of_isometryEquiv_finiteDimensional

[Read exact source](#)

Level 24

linearIsometryEquiv_of_isometryEquiv_finiteDimensional

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometryEquiv_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: finrank_eq, linearIsometryEquiv_of_coordinate_model

Used by in this Project: nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_finiteDimensional, linearIsometryEquiv_of_isometryEquiv_finiteDimensional_codomain, linearIsometryEquiv_of_isometryEquiv_finiteDimensional_domain, linearIsometryEquiv_of_isometry_surjective_finiteDimensional

[Read exact source](#)

Level 25

nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_finiteDimensional

MathlibAnnex.Sphere.nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: isometryEquiv_of_linearIsometryEquiv, linearIsometryEquiv_of_isometryEquiv_finiteDimensional

Used by in this Project: None in this Project

[Read exact source](#)

linearIsometryEquiv_of_isometryEquiv_finiteDimensional_codomain

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometryEquiv_finiteDimensional_codomain

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: finiteDimensional_domain, linearIsometryEquiv_of_isometryEquiv_finiteDimensional

Used by in this Project: linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

[Read exact source](#)

linearIsometryEquiv_of_isometryEquiv_finiteDimensional_domain

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometryEquiv_finiteDimensional_domain

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: finiteDimensional_codomain, linearIsometryEquiv_of_isometryEquiv_finiteDimensional

Used by in this Project: linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

[Read exact source](#)

linearIsometryEquiv_of_isometry_surjective_finiteDimensional

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometry_surjective_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: linearIsometryEquiv_of_isometryEquiv_finiteDimensional

Used by in this Project: None in this Project

[Read exact source](#)

Level 26

linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: linearIsometryEquiv_of_isometryEquiv_finiteDimensional_codomain, linearIsometryEquiv_of_isometryEquiv_finiteDimensional_domain

Used by in this Project: nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_of_finiteDimensional, linearIsometryEquiv_of_isometry_surjective_of_finiteDimensional

[Read exact source](#)

Level 27

nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_of_finiteDimensional

MathlibAnnex.Sphere.nonempty_isometryEquiv_iff_nonempty_linearIsometryEquiv_of_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: isometryEquiv_of_linearIsometryEquiv, linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

Used by in this Project: None in this Project

[Read exact source](#)

linearIsometryEquiv_of_isometry_surjective_of_finiteDimensional

MathlibAnnex.Sphere.nonempty_linearIsometryEquiv_of_isometry_surjective_of_finiteDimensional

Rigidity or equivalence result

Route / section: Project-wide support

Immediate prerequisites in this Project: linearIsometryEquiv_of_isometryEquiv_of_finiteDimensional

Used by in this Project: None in this Project

[Read exact source](#)