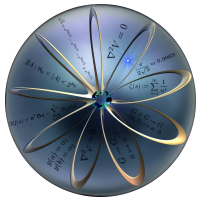

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topics on vectors

Canonical name	TopicsOnVectors
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Entry type	Topic
Classification	msc 53A45
Synonym	topic entry on vectors

I Vector algebra

1. definition of vector
2. vector space
3. parallelogram principle, median vector, difference of vectors
4. geometric applications: mid-segment theorem, common point of triangle medians, median of trapezoid
5. system of coordinates
6. basis
7. coordinate vector
8. position vector
9. `http://planetmath.org/VectorPNorm`norm (through Pythagoras)
10. unit vector
11. direction cosines
12. dot product
13. `http://planetmath.org/node/6178`parallelism condition
14. `http://planetmath.org/node/6178`orthogonality condition
15. vector components and scalar components
16. cross product
17. `http://planetmath.org/CrossProduct`area of parallelogram
18. triple scalar product, volume of prism
19. triple cross product
20. distance of non-parallel lines (an application)
21. matrices and determinants
22. matrices and linear mappings
23. linear systems and solution methods

II Vector calculus

1. definiton of real valued vector function
2. derivative of vector function
3. properties of derivative of vector function
4. derivative of a vector function with constant norm
5. nabla
6. cylindrical coordinates
7. polar coordinates
8. spherical coordinates
9. http://planetmath.org/ClassicalDifferentialGeometrydifferential geometry
10. http://planetmath.org/TangentSpacetangent, http://planetmath.org/NormalVectorno and binormal vectors
11. osculating plane, normal plane and binormal planes
12. Frenet frame
13. Frenet-Serret equations
14. kinematic method for calculating the http://planetmath.org/CurvatureOfACurveradius of curvature
15. gradient of a scalar function
16. divergence of a vector function
17. solenoidal field
18. vector potential
19. curl of a vector function
20. irrotational field, lamellar field

21. Helmholtz decomposition
22. integration of vector functions
23. line integral
24. tensors and differential forms
25. covariant differentiation

III Integral theorems

1. Gauss theorem
2. solid angle
3. Green theorems
4. Stokes theorem
5. circulation and vorticity
6. Kelvin theorem
7. Helmholtz theorems

IV Vector advanced topics

1. alternate characterization of curl
2. tensor notation for a vector
3. transformation law for a vector
4. vector fields: Lagrangian and Eulerian description
5. motion of continuum
6. Jacobians connected with transformation of integration regions
7. Reynolds transport theorem
8. rotations

9. linear transformation spaces
10. linear functionals or covectors
11. bivectors
12. exterior or Grassmann algebra
13. Clifford algebra
14. quaternions
15. projective geometry
16. Grassmann-Cayley algebra
17. vector bundles
18. connections
19. spinors
20. twistors
21. spin structures
22. linear programming and the simplex method
23. representation theory
24. linear extension
25. K-theory
26. Category $\mathrm{Vect}_{\mathbb{R}}$

V Endomorphism decomposition

1. eigenvalues, eigenvectors
2. characteristic and minimal polynomials
3. eigen-subspaces and invariant subspaces

4. http://planetmath.org/CayleyHamiltonTheoremHamilton-Cayley theorem
5. Jordan blocks and canonical decomposition
6. singular value decomposition

VI Lie groups and Lie algebras

1. the connection between Lie groups and Lie algebras
2. commutators or Lie bracket
3. matrix groups and algebras
4. Pauli matrices