

# teaching / dcmath - resources index

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This document contains a topical index for resources on the following webpages:

- <https://danjcalderone.github.io/teaching.html>
- <https://danjcalderone.github.io/dcmath/>

The date above is the last update to this index.  
Topics are sorted roughly by area.

- **Block Matrix Multiplication**

- <https://danjcalderone.github.io/teaching/linalg/product.pdf>
- <https://danjcalderone.github.io/teaching/linalg/BLOCKMATRIX.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/blockmatrix.html>

- **Vectors & Vector Sets**

- <https://danjcalderone.github.io/dcmath/linalg/vectors.html>
- <https://danjcalderone.github.io/papers/vectors.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/vectoradd.html>
- <https://danjcalderone.github.io/papers/columns.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/vectorsets.html>

- **Derivatives, Linearization**

- <https://danjcalderone.github.io/teaching/linalg/derivs.pdf>
- <https://danjcalderone.github.io/teaching/physics/DERIVATIVES.pdf>

- **Calculus: Product Rule, Integration by Parts, Leibnitz Integral Rule**

- <https://danjcalderone.github.io/teaching/calc/CALC.pdf>

- **Inner Products**

- <https://danjcalderone.github.io/teaching/linalg/product.pdf>
- <https://danjcalderone.github.io/papers/vectors.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/innerproducts.html>

- **Norms**

- <https://danjcalderone.github.io/dcmath/linalg/norms.html>
- <https://danjcalderone.github.io/dcmath/linalg/matrixnorms.html>

- **Linear Combinations, Span, Linear Dependence**

- <https://danjcalderone.github.io/teaching/linalg/span.pdf>
- <https://danjcalderone.github.io/papers/columns.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/linearcombs.html>
- <https://danjcalderone.github.io/dcmath/linalg/lineartransforms.html>
- **Convex Combinations**
  - <https://danjcalderone.github.io/papers/columns.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/convexcombs.html>
- **Matrices & Linear Transformations**
  - <https://danjcalderone.github.io/papers/columns.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/matrices.html>
  - <https://danjcalderone.github.io/dcmath/linalg/lineartransforms.html>
  - <https://danjcalderone.github.io/dcmath/linalg/matrixadd.html>
  - <https://danjcalderone.github.io/dcmath/linalg/matrixmultiply.html>
- **Column (& Row) Geometry**
  - <https://danjcalderone.github.io/papers/columns.pdf>
  - <https://danjcalderone.github.io/teaching/linalg/COLORROW.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/colsnrows.html>
- **Bases & Coordinates**
  - <https://danjcalderone.github.io/teaching/linalg/coords.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/coordsnbases.html>
  - <https://danjcalderone.github.io/dcmath/linalg/coordinatetransforms.html>
  - <https://danjcalderone.github.io/dcmath/linalg/orthonormaltransforms.html>
  - <https://danjcalderone.github.io/dcmath/linalg/similarity.html>
- **Projections**
  - <https://danjcalderone.github.io/dcmath/linalg/projections.html>
- **Orthogonality & Orthonormal Transformations & Rotations**
  - <https://danjcalderone.github.io/teaching/linalg/rotation.pdf>
  - <https://danjcalderone.github.io/teaching/linalg/ROTATIONS.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/orthonormaltransforms.html>
- **Inverses**
  - <https://danjcalderone.github.io/teaching/linalg/inverse.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/inverses.html>
- **Pseudo-inverses & Left and Right Inverses**
  - <https://danjcalderone.github.io/dcmath/linalg/pseudoinverses.html>
  - <https://danjcalderone.github.io/dcmath/linalg/pseudoinverses.html>
- **Nullspaces**

- <https://danjcalderone.github.io/teaching/linalg/span.pdf>
- <https://danjcalderone.github.io/dcmath/linalg/nullspace.html>
- **Matrix Rank**
  - [urlhttps://danjcalderone.github.io/teaching/linalg/span.pdf](https://danjcalderone.github.io/teaching/linalg/span.pdf)
  - <https://danjcalderone.github.io/dcmath/linalg/rank.html>
- **Fundamental Theorem of Linear Algebra**
  - <https://danjcalderone.github.io/teaching/linalg/span.pdf>
- **Eigenvalues & Eigenvectors**
  - <https://danjcalderone.github.io/teaching/linalg/DIAGONAL.pdf>
  - <https://danjcalderone.github.io/dcmath/linalg/eigenvalues.html>
- **Positive Definite & Quadratic Forms**
  - <https://danjcalderone.github.io/teaching/linalg/PSD.pdf>
  - <https://danjcalderone.github.io/teaching/linalg/SVD.pdf>
- **Singular Value Decomposition & Polar Decomposition**
  - <https://danjcalderone.github.io/teaching/linalg/decomps.pdf>
  - <https://danjcalderone.github.io/teaching/linalg/SVD.pdf>
- **Gaussian Elimination & Elementary Matrices**
  - <https://danjcalderone.github.io/dcmath/linalg/elementary.html>
  - <https://danjcalderone.github.io/dcmath/linalg/gaussianelim.html>
- **Discrete Fourier Transform**
  - <https://danjcalderone.github.io/teaching/linalg/DFT.pdf>
- **Linear Systems, Control/Observability**
  - <https://danjcalderone.github.io/teaching/linalg/LTI.pdf>
  - <https://danjcalderone.github.io/teaching/linalg/CTRLOBS.pdf>
- **Algebraic Graph Theory**
  - <https://danjcalderone.github.io/teaching/network/GRAPHS.pdf>
- **Markov Decision Processes**
  - <https://danjcalderone.github.io/teaching/network/MDPS.pdf>
- **Dynamics & Modeling**
  - <https://danjcalderone.github.io/teaching/physics/CIRCUITS.pdf>
  - [https://danjcalderone.github.io/teaching/physics/DYNAMICS\\_EXAMPLES.pdf](https://danjcalderone.github.io/teaching/physics/DYNAMICS_EXAMPLES.pdf)
- **Controls**
  - <https://danjcalderone.github.io/teaching/ctrls/DISTURBANCES.pdf>
  - <https://danjcalderone.github.io/teaching/mvctrls/LFR.pdf>
- **Estimation & Kalman Filters**

- <https://danjcalderone.github.io/teaching/estim/kfreference.pdf>
- <https://danjcalderone.github.io/teaching/estim/KALMAN.pdf>
- <https://danjcalderone.github.io/teaching/estim/kfexamples.ipynb>  
(this last one is a python notebook with many types of Kalman filters)
- **Data Science**
  - <https://danjcalderone.github.io/teaching/learn/REGRESSION.pdf>
  - <https://danjcalderone.github.io/teaching/learn/CLASSIFICATION.pdf>
- **Basic Algorithms**
  - <https://danjcalderone.github.io/teaching/coding/ALGORITHMS.pdf>
- **Vector Graphics**
  - <https://danjcalderone.github.io/teaching/coding/DRAWING.pdf>
- **Python (mostly arrays)**
  - <https://danjcalderone.github.io/teaching/coding/ARRAYS.pdf>