

Linear Algebra

The general goal in this discipline is for students to learn the techniques of matrix manipulation so that they can solve systems of linear equations in any number of variables. Linear algebra is most often combined with another subject, such as trigonometry, mathematical analysis, or precalculus.

- 1.0 Students solve linear equations in any number of variables by using Gauss-Jordan elimination.

- 2.0 Students interpret linear systems as coefficient matrices and the Gauss-Jordan method as row operations on the coefficient matrix.

- 3.0 Students reduce rectangular matrices to row echelon form.

- 4.0 Students perform addition on matrices and vectors.

- 5.0 Students perform matrix multiplication and multiply vectors by matrices and by scalars.

- 6.0 Students demonstrate an understanding that linear systems are inconsistent (have no solutions), have exactly one solution, or have infinitely many solutions.

- 7.0 Students demonstrate an understanding of the geometric interpretation of vectors and vector addition (by means of parallelograms) in the plane and in three-dimensional space.

- 8.0 Students interpret geometrically the solution sets of systems of equations. For example, the solution set of a single linear equation in two variables is interpreted as a line in the plane, and the solution set of a two-by-two system is interpreted as the intersection of a pair of lines in the plane.

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- 9.0** Students demonstrate an understanding of the notion of the inverse to a square matrix and apply that concept to solve systems of linear equations.
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- 10.0** Students compute the determinants of 2×2 and 3×3 matrices and are familiar with their geometric interpretations as the area and volume of the parallelepipeds spanned by the images under the matrices of the standard basis vectors in two-dimensional and three-dimensional spaces.
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- 11.0** Students know that a square matrix is invertible if, and only if, its determinant is nonzero. They can compute the inverse to 2×2 and 3×3 matrices using row reduction methods or Cramer's rule.
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- 12.0** Students compute the scalar (dot) product of two vectors in n -dimensional space and know that perpendicular vectors have zero dot product.