

## Math 307

### Outline

#### **Linear Equations** (8 hours)

*Topics:* Solving linear equations, vector and matrix norms, condition number.

*Applications:* Lagrange interpolation, splines, finite difference approximation.

#### **Subspaces, Basis and Dimension** (8 hours)

*Topics:* Vector spaces, subspaces, basis, dimension, basis for  $N(A)$ ,  $R(A)$ ,  $N(A^T)$  and  $R(A^T)$ .

*Applications:* Formula matrix for a chemical system, Graphs and resistor networks.

#### **Orthogonality** (6 hours)

*Topics:* Orthonormal bases and orthogonal matrices, Complex vector spaces.

*Applications:* Least squares.

#### **Eigenvalues and Eigenvectors** (12 hours)

*Topics:* Eigenvalues and eigenvectors, Hermitian matrices.

*Applications:* Effective resistance (revisited), Power method, Markov chains, Anderson tight binding model, Google PageRank, Singular Value Decomposition, Principal Co-ordinate analysis.