# 18.06 Spring 2008
# Outline for Final Exam

1. Elimination and solving linear systems
    - how to find particular and complete solutions
    - solvability, uniqueness, rank
    - Cramer's rule
2. Inverses
    - how to find them and use them
    - relationship to cofactors
3. A = LU and PA=LU decompositions
    - row reduced echelon form R
4. Vector spaces and subspaces
    - definitions, examples
5. Linear independence and bases
    - span and dimension
6. Linear transformations T
    - finding T(x) for x expressed in a basis
    - how to translate into a matrix
7. Four subspaces
    - dimensions
    - how to find a basis for each
    - orthogonality properties
8. Orthogonality
9. Projection matrices
    - how to construct them
    - what they do
    - application to solve least squares
10. Orthogonal matrices
    - basic properties
11. Gram-Schmidt
    - how to do the Gram-Schmidt process
    - A = QR decomposition

12. Determinants
    - definitions and properties
    - specific examples
    - methods: elimination, big formula, cofactors
13. Eigenvalues and eigenvectors
    - how to find them
    - relationship to determinant and trace
    - examples and properties
14. Diagonalization
    - how to find it
    - how to use it
    - solving differential equations
15. Spectral theorem for symmetric matrices
16. Positive definite matrices
    - properties and tests
    - why they are important
    - minimizing a quadratic
17. Similarity
    - definition
    - relationship to diagonalization
    - Jordan canonical form
18. Singular value decomposition
    - how to find it from A'A
    - what information it gives you
19. Graphs and networks
    - translating graph questions into linear algebra
    - application to circuits
20. Markov matrices
    - steady state and applications
21. Complex matrices
    - complex dot products
    - complex analogues of symmetric, orthogonal, etc.

Special matrices: permutation, projection, rank one, symmetric, orthogonal, reflection