CS412 List of Topics for the Final

Note that this list is a summary of main topics you are expected to know for your final. You should be familiar with other subtopics and terms mentioned in your text (chapters 12-17 & 20) and discussed in class. Note that while this exam focuses on the last half of the semester, there are some problems that require knowledge about methods from the first half.

Curve Fitting
  – Least Squares
  – Multiple Linear Regression
  – Nonlinear Regression
Interpolation
  – Polynomial, Linear, Quadratic
  – Lagrange
  – Newton's Divided Difference
  – Extrapolation, Oscillation
  – Inverse Interpolation
Spline
  – Piece-wise Linear Interpolation
  – Piece-wise Quadratic Polynomial Interpolation
  – Linear, Quadratic, Cubic
  – Ending conditions: Natural, Clamped End, Not-a-Knot
Numerical Integration
  – Newton-Cotes
  – Trapezoidal Rule, Composite Trapezoidal Rule
  – Simpson's 1/3 Rule, Composite Simpson's 1/3 Rule
  – Simpson's 3/8 Rule
  – Boole's Rule
  – Errors
Extrapolation
  – Richardson's Extrapolation
  – Romberg Integration, Algorithm
  – Gauss Quadrature
  – Undetermined Coefficients, Midpoint Formula
Eigenvalues, Eigenvectors
  – Characteristic Polynomial
  – Symmetric, Non symmetric matrices
  – Power Method
  – Inverse Power Method
  – Shifted Inverse Power Method

In studying, I recommend that you analyze each algorithm and identify the
  – positive aspects
  – negative aspects
  – operation counts
and other vital information that makes the algorithm unique. You should also be familiar with the MATLAB functions appropriate for each section. It is also a good idea to look over assigned homework (HW4-6) and the end of the chapter exercises in the text.