Review Topics for Midterm

1. Non-linear root finding
   (a) Secant method
   (b) Newton’s method
   (c) Fixed point iteration
   (d) Convergence rates (quadratic, linear, etc.)
   (e) Contraction Mapping Theorem

2. Floating point arithmetic
   (a) Base-2 representation of floating point numbers
   (b) Machine precision
   (c) Round-off error

3. Conditioning
   (a) Forward error analysis
   (b) Backward error analysis
   (c) Absolute condition number of a problem
   (d) Relative condition number of a problem

4. Numerical linear algebra
   (a) Gaussian elimination with pivoting
   (b) $LU$ decomposition with pivoting
   (c) Vector and matrix norms
   (d) Condition number of a matrix
   (e) The singular value decomposition