Study Guide for Midterm Exam

in-class on Friday 29 October

Problems will be in these categories:

- apply an algorithm/method in a simple concrete case (*no calculator needed!*)
- state a threorem or definition
- write a short pseudocode, or a MATLAB/OCTAVE code if you want, to state an algorithm
- explain/show in words (*E.g. Why is one theorem or method is better than another, when applied to this example? Write in complete sentences.*)

Algorithms and methods. You must know what problem they solve, how to do a few steps or an easy case, and what their relative strengths and weaknesses are. List here has (*reference in 9th ed. Burden&Faires*):

- bisection method (*Alg 2.1*)
- Newton's method (*Alg 2.3*)
- Secant method (*Alg 2.4*)
- Vandermonde matrix method for finding interpolating polynomial $P(x)$ (*online slides*)
- Newton form method for finding $P(x)$ (*online slides*)
- Lagrange polynomials method for finding $P(x)$ (*online slides; Thm 3.2*)
- Neville's method for evaluating $P(x)$ w/o finding its coefficients (*Thm 3.5;* `nev.m` *online; Alg 3.1*)

Definitions. (*page numbers in 9th ed. Burden&Faires*)

- rate of convergence of sequences; "big O" (*page 37*)
- order of convergence of sequences, including "linear" and "quadratic" convergence (*page 79*)

Theorems. (*theorem number in 9th ed. Burden&Faires*)

- Intermediate Value Theorem (*Thm 1.11*)
- Mean Value Theorem (*Thm 1.8*)
  - Rolle's Theorem (a special case of MVT) (*Thm 1.7*)
- Taylor's Remainder Theorem (*Thm 1.14*)
- Lagrange's Remainder Theorem (*Thm 3.3*)
- fixed-point theorems:
  - existence and uniqueness of fixed point of $g(x)$ (*Thm 2.3*)
  - iterations $p_n = g(p_{n-1})$ converge if [these conditions] (*Thm 2.4*)
- Newton's method converges quadratically (*Thm 2.9*)

Other.

- be able to sketch the basic ideas of 64-bit binary representation of real numbers; "IEEE 754" (*pages 17–19 in 9th ed. Burden&Faires*)