MAT 4310, Sp '13

Topics List; Test 1 Summary

1. §1.1 — Significant digits, error

   → *Accuracy v precision; significant digits; absolute v relative error; bad subtractions*

2. Python — Introduction to the Python programming language, the IDLE environment, data types, control statements, importing the math module, defining functions, lists: defining, slicing, & list methods; "Portable Python" (for PCs)

   → *Programming in Python: defining functions; using loops & conditionals; using standard math functions; operating with lists; Gaussian and Gauss-Kronrod integration with Python*

3. §1.2, p 24–26 — Taylor's theorem, Mean Value Theorem, Taylor's Theorem for $f(x+h)$ remainders: Lagrange, Cauchy, and uniform

   → *Statement of Taylor's Thm; uniform remainder;* $O(h^n)$*; Taylor forms* $f(x) = \ldots$ *and* $f(a+h) = \ldots$*; using Taylor's thm to analyze errors in numerical formulas/procedures*

4. §3.2, p 93 — Convergence analysis of Newton's method

   → *Newton's method formula; quadratic convergence; analyzing the error term to show* $e_{n+1} = -\frac{1}{2} \cdot \frac{f''(\xi_x)}{f'(x_n)} \cdot e_n^2 \approx c(\delta) \cdot e_n^2$

5. §3.3, p 114 — Convergence analysis of the secant method

   → *Secant method formula; superlinear convergence; analyzing the error term to show* $e_{n+1} = -\frac{1}{2} \cdot \frac{f''(\xi_x)}{f'(x_n)} \cdot e_n \, e_{n-1} \approx c(\delta) \cdot e_n^{\frac{1}{2}(1+\sqrt{5})} \approx c(\delta) \cdot e_n^{1.6}$

6. §5.3 — Romberg integration

   → *Trapezoid rule and error; the Romberg triangle:* $R_{n,0}$ *= composite trapezoid rules,* $R_{n,j>0}$ *= arithmetic linear combination of previous terms (Richardson extrapolation); reusing previous function computations; accuracy of the method*