MATH 128A, FALL 2014, WILKENING

Homework 1: Due Wed, Sep 10

1.1: 1b, 4b, 6, 9abcd, 21, 26ac, 27abc, 28bc
- 9b: express the error bound as a function of x.
- 21: find a bound independent of x that works for all x in the given range.

1.2: 1bh, 3c, 5a, 10ab, 15abcd
- 15d: write the result in the form $d.dddddddd + 2^{-dd}$, where d is a decimal digit, to avoid a ridiculously long answer

Homework 2: Due Wed, Sep 17

1.3: 1a, 6, 7, 13ab, 16
- 6,7: justify your answers. You may use the fact that $|\sin x| \le |x|$, and $|\ln(1+x)| \le |x|$ for $x > -1$, without proof.

2.1: 2b, 13 , 17
- 13: use $[a_1, b_1] = [2.9, 3.0]$ as the starting interval

2.2: 1d, 4, 8, 11abcf, 17
- 4: implement them in matlab, maple or mathematica and rank them based on what you see

Programming assignment 1: Due Wed, Sep 17

Part 1: Write a program to take 6 numbers a, b, c, d, e, f and find the locations $x_{\min}$ and $x_{\max}$ of the absolute extrema of the function

$$p(x) = cx^3 + dx^2 + ex + f$$

over the interval $[a, b]$. Use the appropriate version of the quadratic formula (which depends on the parameters c,d,e) to avoid unnecessary cancellation of digits. Pick a few sets of numbers c, d, e, f that illustrate some of the possibilities when $a = -1, b = 2$, plot the resulting $p(x)$ over $[-1, 2]$, and report the extrema returned by your code. What to hand in: a printout of your code, 4 plots annotated with the values of c, d, e, f that you picked, and the results, $x_{\min}, x_{\max}, p(x_{\min}), p(x_{\max})$. (You may annotate the hardcopy of the plots by hand if that is easiest.)

Part 2: Write a code that takes an integer, n, and returns the nth term in the following sequence:

$$a_1 = 1, \quad a_2 = \sqrt{1+2}, \quad a_3 = \sqrt{1+2\sqrt{1+3}}, \quad a_4 = \sqrt{1+2\sqrt{1+3\sqrt{1+4}}}, \quad \dots$$

Evaluate a_n for $1 \le n \le 40$. Guess the limiting value of the sequence, $a = \lim_{n\to\infty} a_n$, and make a plot of $\ln(|a_n - a|)$ vs n. Also plot the line $y = 3 - (\ln 2)n$, treating n as a continuous variable. From the plot, what sequence β_n would you guess is appropriate here: $a_n - a = O(\beta_n)$?

Date: Aug 28, 2014.