Math 170B, Spring 2023 HOMEWORK #1 due Friday, April 7

Problems 1 and 2 of this homework include course content with practice for implementing algorithms, too. Problem 3 is a "tell me about yourself" survey, which you can find in Canvas under "quizzes". It is worth 10pts and is graded automatically by Canvas.

A. (10pts)

(1) Select a computer environment that you can feel comfortable with. Compute and print the elements in the sequence

$$a_n = n \ln(1 + 1/n),$$

when $n = \{1, 2, 3, \ldots, 48, 49, 50, 100, 500, 2500\}$.

(2) Derive the Taylor series at $x = 0$ for the function

$$f(x) = \ln(x + 1)$$

and write it in summation notation (include an expression for the remainder). Determine the smallest number of terms that must be taken in the series to yield $\ln(1.5)$ with an error less than 10^{-8}

B. (10pts)

(1) Implement Horner's method (the algorithm to evaluate a nested multiplication). Use this to compute the value of the polynomial

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0,$$

at $x = \{1, 5, 10\}$ where

$$n = 10, \quad a_i = 1/i, \quad a_0 = 0, \quad 1 \leq i \leq n$$

C. (10pts)

(1) Go to Canvas quizzes and take the survey "First Day Survey: Tell Me About Yourself #FinAid". Note that you have unlimited attempts, except you must be done by Friday, April 14, at 11:59pm).

For solutions to computer problems include a brief description of the implementation (how does it work), show the source code and an image of the outputs.

Section B: Extra practice problems: Problems in section B are for your practice; please do not hand them in. However, it is important that you feel comfortable with these problems as they help practicing the materials.

(1) Kincaid & Cheney, §1.1 (page 13): 1; 5 (a), (b), (c); 23

(2) Kincaid & Cheney, §1.2 (page 25): 6, 7, 16, 25, 31