

# Math 128A: Worksheet #1

Name: \_\_\_\_\_ Date: January 27, 2021

Spring 2021

**Problem 1.** Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  be  $f(x) = e^x + x$ . Show that  $f$  has exactly one root.

**Problem 2** (Section 1.1, #6c). Find  $\max_{a \leq x \leq b} |f(x)|$  for the following functions and intervals.

$$f(x) = x^3 - 4x + 2, \quad [1, 2].$$

**Problem 3** (Section 1.1, #13). Find the third Taylor polynomial  $P_3(x)$  for the function  $f(x) = (x - 1) \ln(x)$  about  $x_0 = 1$ .

- (a) Use  $P_3(0.5)$  to approximate  $f(0.5)$ . Find an upper bound for error  $|f(0.5) - P_3(0.5)|$  using the error formula and compare it to the actual error.
- (b) Find a bound for the error  $|f(x) - P_3(x)|$  in using  $P_3(x)$  to approximate  $f(x)$  on the interval  $[0.5, 1.5]$ .

**Problem 4** (Section 1.2, #3a). Find the largest interval in which  $p^*$  must lie to approximate  $p = 150$  with relative error at most  $10^{-3}$ .

**Problem 5.** Suppose that  $\alpha_n = \alpha + \mathcal{O}(n^{-2})$  as  $n \rightarrow \infty$ . Show that  $\alpha_n = \alpha + \mathcal{O}(n^{-1})$ .

**Problem 6** (Section 2.1, #6a). Use the Bisection method to find a solution accurate to within  $10^{-5}$  for the following problem:

$$3x - e^x = 0 \text{ for } 1 \leq x \leq 2.$$