

**HW1A. Written Homework 1A.****Due Week 1 Wednesday 11:59PM****Name:**

**Instructions:** Upload a pdf of your submission to **Gradescope**. This worksheet is worth 20 points: up to 8 points will be awarded for accuracy of certain parts (to be determined after the due date) and up to 12 points will be awarded for completion of parts not graded by accuracy.

- (1) Let  $f(x) = e^{2x}$ .
- (a) Calculate the 4<sup>th</sup> degree Taylor polynomial  $T_4(x)$  of  $f(x)$  about  $x = 0$ .
  - (b) Use  $T_4(x)$  to estimate  $e^3$ .
  - (c) Calculate the remainder term  $R_4(x)$ . You are expected to use a calculator for this to use a sufficiently exact value for  $e^3$ .

**(2)** Let  $f(x) = \cos(x)$ .

**(a)** Find the 4<sup>th</sup> degree Taylor polynomial  $T_4(x)$  of  $f(x)$  about  $x = 0$ .

**(b)** Find a closed form of  $f^{(n)}(x)$ .

**(c)** Using Taylor's Inequality and the upper bound  $M = 1$ , find  $n$  minimal such that  $T_n(\frac{\pi}{3})$  approximates  $\cos(\frac{\pi}{3})$  up to 3 decimal places. That is, find  $n$  minimal such that  $|R_n(x)| < \frac{1}{2}10^{-4}$ .