

# MAE 3210 - Spring 2019 - Homework 1

Homework 1 is due **online** through Canvas in PDF format by 11:59PM on Monday January 14. Please complete your solutions by hand (or typed) and scan them in order to submit. That is, no actual programming is required for this particular homework.

## Monday's class:

1. Read course syllabus in detail, including *USU University Policies* linked in syllabus. You do not need to submit anything for this problem.

## Wednesday's class:

2. Textbook problem 2.26.  
(Textbook may have a typo labeling this as problem 20.26, see page 53)

## Friday's class:

- 3.a. The following infinite series can be used to approximate  $e^x$ :

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!} + \cdots$$

- (i) Prove that this Maclaurin series expansion is a special case of the Taylor series expansion (Eq. (4.7) in text) with  $x_i = 0$  and  $h = x$ .
  - (ii) Use a Taylor series to estimate  $f(x) = e^{-x}$  at  $x_{i+1} = 1$  for  $x_i = 0.5$ . Employ the zero-, first-, second-, and third-order versions and compute  $|\varepsilon_t|$  for each case.
- 3.b. Use zero- through third-order Taylor series expansions to predict  $f(-1)$  for

$$f(x) = 20x^3 - 5x^2 + 7x - 80$$

using a base point at  $x = 1$ . Compute the true percent relative error  $\varepsilon_t$  for each approximation.