Homework due Week 11, day 1 Tue (Please use your own paper)

Name : _____

1. Find the Maclaurin series for f using the definition. Verify your answer with Table 1 and Wolfram|Alpha.
   a. $f(x) = \dfrac{1}{1-x}$
   b. $f(x) = \ln(1+x)$
   c. $f(x) = 2^x$

2. Find the Taylor series for $f(x)$ centered at $x = a$.
   a. $f(x) = x^4 - 3x^2 + 1$ and $a = 1$
   b. $f(x) = \sqrt{x}$ and $a = 16$. Hint: See Example 8 on page 766. See also an almost identical problem: overleaf.com/read/krtzsqgykktb

3. The Maclaurin series for $\arctan x$ is $\displaystyle\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1}$ for $-1 < x < 1$.
   a. Determine the Maclaurin series for $x^3 \arctan x$.
   b. Determine the Maclaurin series for $\int x^3 \arctan x \, dx$. (Hint: use term-by-term integration, Sec 11.9).
   c. Determine a series that represents $\int_0^{0.1} x^3 \arctan x \, dx$. (Hint: follow Example 11b pg 769).
   d. If the first two non-zero terms of the series are used to estimate the value of the definite integral from the previous part, provide a bound on the error of this estimate. (Hint: follow Example 11b pg 769).

Homework

4. Do Sec 11.10 Example 12 on pg 769 using *series*. Close the book while you work out the answer, and verify with the book afterwards.

5. (a) Use *series* to evaluate the limit. Use Table 1. (b) Verify your answer using either L'hopital rule or the computer. (Hint: follow Example 12 pg 769).

$$\lim_{x\to 0}\frac{x-\ln(1+x)}{x^2}$$

6. (a) Use *series* to evaluate the limit. Look up the relevant Maclaurin series from Table 1. (b) Verify your answer using either L'hopital rule or a computer. (Hint: follow Example 12 pg 769).

a. $\lim_{x\to 0}\frac{1-\cos x}{1+x-e^x}$

b. $\lim_{x\to 0}\frac{\sin x - x + \frac{1}{6}x^3}{x^5}$