1. Do, but don’t turn in: Memorize the formula for the nth-degree Taylor Polynomial for \( f(x) \) centered at \( a \):

\[
T_n(x) = f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots + \frac{f^{(n)}(a)}{n!}(x-a)^n
\]

\[
= \sum_{i=0}^{n} \frac{f^{(i)}(a)}{i!}(x-a)^i
\]

2. Find the 4th degree Taylor polynomial for \( \tan(x) \) centered at \( a = 0 \).

3. Suppose that a function \( f(x) \) is approximated near \( a = 0 \) by the 3rd degree Taylor polynomial \( T_3(x) = 4 - 3x + \frac{x^2}{5} + 4x^3 \). Give the values of \( f(0) \), \( f'(0) \), \( f''(0) \), and \( f'''(0) \).

4. Find the 10th degree Taylor polynomial centered at \( a = 1 \) of the function \( f(x) = 2x^2 - x + 1 \).

5. Suppose a function \( f(x) \) has the following graph:

Graph of \( f(x) \)

If the 2nd degree Taylor polynomial centered at \( a = 0 \) for \( f(x) \) is \( T_2(x) = bx^2 + cx + d \), determine the signs of \( b \), \( c \) and \( d \).

6. Show your work in an organized way:

(a) Find the 7th degree Taylor polynomial centered at \( a = 0 \) for \( \sin(x) \).

(b) Use \( T_7(x) \) to estimate \( \sin(3^\circ) \). Don’t forget to convert to radians.

(c) Compare your estimate for \( \sin(3^\circ) \) to the value that technology gives you. How accurate is the approximation you found?
7. This problem asks for Taylor polynomials for \( f(x) = \ln(1 + x) \) centered at \( a = 0 \). Show your work in an organized way.

(a) Find the 4th, 5th, and 6th degree Taylor polynomials for \( f(x) = \ln(1 + x) \) centered at \( a = 0 \).

(b) Find the nth degree Taylor polynomial for \( f(x) = \ln(1 + x) \) centered at \( a = 0 \), written in expanded form.

(c) Find the nth degree Taylor polynomial for \( f(x) = \ln(1 + x) \) centered at \( a = 0 \), written in sigma (summation) notation.

(d) Use the 7th degree Taylor polynomial to estimate \( \ln(2) \).

(e) Compare your answer to the estimate for \( \ln(2) \) given by your calculator. How accurate were you?

(f) Looking at the Taylor polynomials, explain why this estimate is less accurate than the estimate in the previous problem for \( \sin(3\degree) \).

8. Do, but don’t turn in: memorize the nth degree Taylor polynomials centered at \( a = 0 \) for \( e^x \), \( \sin(x) \), \( \cos(x) \), \( \ln(1 + x) \), and \( \frac{1}{1-x} \). Be able to write them down with ease in both expanded form and sigma notation.