Write your final answer to each question in the space provided to the right. You must show your work to receive credit for a correct answer.

You may use a non-graphing calculator and one 8 1/2 x 11 sheet of handwritten notes.

1. Compute the quadratic approximation to the function

\[ f(x) = \sec(3x) \]

about \( x = 0. \) \textit{Hint:} \( \frac{d}{dx} \sec(x) = \sec(x) \tan(x) \) and \( \frac{d}{dx} \tan(x) = \sec^2(x). \) 

\[ \text{_______________} \quad (10) \]
2. Use Taylor’s result to compute an upper bound on the error incurred using $T_0(x)$ (the constant approximation) instead of $\sec(x)$ in the range $[-\pi/4, \pi/4]$. 

Note that you are to use $\sec(x)$ here and not $\sec(3x)$ as in the previous problem.
3. (a) Find the Taylor series expansion for the function

\[ f(x) = 5 \sin(3x) + \ln(1 - x) \]

about \( x = 0 \). You must express your answer using summation notation.

(10)

(b) For what \( x \) does this series expansion converge?

(5)
4. Estimate the value of the definite integral

\[ I = \int_{1}^{2} e^{x} \ln x \, dx \]

by replacing the integrand with its linear approximation at \( x = 1 \).