

Math 126, Midterm #1, 1/26/06

Name: _____
Section: _____

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

_____ (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.

(15)

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 $x = 1$. _____(10)