Math 114 **Homework for Class 14, Due with HW 6** *Fall 2005*

Taylor's Theorem and Error in Tangent Line Approximations

Name:

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1. In class we saw the following equation for the error in a tangent line approximation.

$$\text{Error}, E(h) = \text{True Value} - \text{Approximate Value} = f(a+h) - (f(a) + f'(a)h)\,.$$

(a) Explain, using complete sentences, why we write $E(h)$. Be sure to state what both E and h are. (*This is related to what the function notation means.*)
(b) Explain, in complete sentences, how the approximation error changes as we get closer and farther from the value a.

2. For the following functions, find the equation of the tangent line at $x = 0$ and find a formula for the error $E(h)$. Then approximate $f(1)$ and evaluate the error in the approximation.
(a) $f(x) = \dfrac{1}{x+3}$

(b) $f(t) = t^2 + 3t + 5$

(c) $f(x) = xe^x$

3. Pick one of the functions in *(2.)*, graph the function and the tangent line and illustrate the error in your approximation to $f(1)$.

4. Pick one of the functions in *(2.)* along with its error formula $E(h)$ and show that

$$\lim_{h\to 0} E(h) = 0; \qquad \text{and} \qquad \lim_{h\to 0} \frac{E(h)}{h} = 0$$