Math 115 Quiz 7: § 3.9, 4.1, 4.2 Using First and Second Derivatives **Mon 8 November 2010**
Name: _____

You have 20 minutes to complete this quiz. Make your variables clear and consistent (so if you want to say, for example, $\frac{dy}{dx}$, you should also mention $y = f(x)$, or "y is a function of x"). Calculators are OK.

1. **Definitions/Concepts.**

   (a) (2 pts) Complete this statement: Suppose f is differentiable at a. Then, for values of x near a, the tangent line approximation to $f(x)$ is

   (b) (1 pt) TRUE or FALSE: If the derivative of f is zero at the point $x = a$, then a is either a local maximum or a local minimum.

2. **Questions/Problems.** (3 pts) For which powers p is $y = x^p$ concave up on the region $x \in (0, \infty)$? Explain.

   (3 pts) Are exponential functions of the form $y = m\,c^t$ always increasing if $m > 0$? If yes, say why. If no, give a concrete counterexample (equation and sketch of graph).

3. **Computations/Algebra.** (1 pt) Find all critical points of the following function. Use the second derivative to tell if each critical point is a local maximum, local minimum, or cannot be determined.

$$f(x) = (x^3 - 8)^4$$