Name: _____

Math 1311
Test 2
Fall 2004

1. (a) Apply the first derivative test to classify each of the critcal points of the function $f(x) = x^2 e^{-x/3}$. If you have a graphics calculator, plot $y = f(x)$ to see whether the appearance of the graph corresponds to your classification of the critical points.

(b) Determine the open intervals on the x-axis on which the function $f(x) = 3x^4 + 4x^3 - 12x^2$ is increasing as well as those on which it is decreasing. If you have a graphics calculator, plot the graph $y = f(x)$ to see whether it agrees with your result.

2. Find $\dfrac{dy}{dx}$

   (a) $y = e^{-2x} \sin 3x$

   (b) $x \ln y = x + y$

3. (a) Write an equation of the line tangent to the given curve at $x^2 - 3xy + 2y^2 = 0$.

(b) Find $\dfrac{dy}{dx}$ if $y = \left(1 + \dfrac{1}{x}\right)^x$

4. An airplane flying horizontally at an altitude of 3 mi and at a speed of 480 mi/h passes directly above an observer on the ground. How fast is the distance from the observer to the airplane increasing 30 s later?

5. A ladder 41 ft long that was leaning against a vertical wall begins to slip. Its top slides down the wall while its bottom moves along the level ground at a constant speed of 4 ft/s. How fast is the top of the ladder moving when it is 9 ft above the ground?