Name:_____

Math 1311
Fall 2004
PreTest II

1. A page of a book is to contain 27 square inches of print. If the margins at the top, bottom, and one side are 2 inches and the margin at the other side is 1 inch, what size page would use the least paper?

2. A rocket is launched vertically is tracked by a radar station located on the ground 4 miles from the launch site. What is the vertical speed of the rocket at the instant its distance from the radar station is 5 miles and this distance is increasing at the rate of 3600 miles per hour?

3. Find the derivative of the functions

   (a) $f(x) = sin(ln(2x))$

   (b) $f(x) = ln\frac{x+1}{x-1}$

   (c) $g(t) = t^3.sin(2t)^2$

   (d) $f(x) = \frac{sin(x)}{1+cos(x)}$

   (e) $y = \dfrac{x + \sin x}{x^2 + \cos x}$

   (f) $y = \ln(x + e^{-x})$

4. (a) Find $\frac{dy}{dx}$ if $x^3 + y^3 = xy$.

   (b) Find the equation of the tangent line to the curve $x = \sin 2y$ at the point where $x = 1$.

5. Suppose that you are to make a rectangular box with a square base from two different materials. The material for the top and four sides of the box costs one dollar per square foot; the material for the base costs two dollars per square foot. Find the dimensions of the box of greatest possible volume if you are allowed to spend 144 dollars for the material to make it.

6. A water tank is in the shape of a cone with vertical axis and vertex downward. The tank has radius 3 ft and is 5 ft high. At first the tank is full of water, but at time $t = 0$ (in seconds), a small hole at the vertex is opened and the water begins to drain. When the height of the water in the tank has dropped to 3 ft, the water is flowing out at 2 ft^3/s. At what rate, in feet per second, is the water level dropping then?

7. A weather balloon that is rising vertically is observed from a point on the ground 300 ft from the spot directly beneath the balloon. At what rate is the balloon rising when the angle between the ground and the observer's line of sight is $45°$ and is increasing at $1°$ per second? (Need to change $1°$ to radians)

8. Find dy/dx by implicit differentiation if $x = ye^y$.

9. Determine the open intervals on the x-axis on which the function is increasing as well as those on which it is decreasing. If you have a graphics calculator or computer, plot the graph $y = f(x)$ to see whether it agrees with your results.

   (a) $f(x) = x^4 - 2x^2 + 1$

   (b) $f(x) = xe^{-x/2}$