Full Name: _____ Signature: _____
Student Number: _____

Math 120 Midterm Test 3 Nov. 17, 2006 50 min.

1. For each of these short-answer questions, write your final answer in the box provided. *Only your final answer will be graded*, preliminary work will not be graded.

   (a) Find dy/dx if $x^3 + y^3 = 6xy$.

   (b) Find the rate of change of the radius of a circle when its area is 100 cm^2, if the area is increasing at a rate 2 cm/min.

   (c) Find the approximation for $\sqrt{8}$ coming from the linearization of $f(x) = \sqrt{x}$ at $x = 9$.

   (d) For which x is the graph $y = \frac{1}{12}x^4 - \frac{1}{6}x^3 - x^2 + 5x - 7$ concave up?

2. Determine where the function

$$f(x) = \frac{1}{x^2 - 9}$$

is increasing, decreasing, and concave up/down, find any asymptotes and intercepts, and make an accurate sketch of its graph.

3. Find the area of the largest rectangle that can be inscribed (with sides parallel to the axes) in the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

4. Find the critical points and singular points (points where the derivative is not defined) of the function $f(x) = x^{2/3} - (2x - 8)^{2/3}$. Find its absolute maximum and minimum values, if they exist.