

NAME \_\_\_\_\_

Math 12  
Test 4  
Fall 2011

You have 50 minutes to complete this test. You must *show all work* to receive full credit. Work any 6 of the following 7 problems. Clearly **CROSS OUT** the problem you do not wish me to grade. Each problem is worth 16 points, and you get 4 points for free, for a total of 100 points. The answers will be posted on the electronic reserves later today.

1. Find the area of the region between  $y = 3x - x^2$  and the  $x$ -axis, from  $x = 0$  to  $x = 4$ . Be sure to sketch a graph first!

2. Find all four second-order partial derivatives of  $f(x, y) = ye^x - x \ln y$ . Do NOT simplify.

3. Find and classify the critical points of  $f(x, y) = x^3 - y^3 + 6xy$ .

4. Suppose two products have demand equations  $D_1 = 500 + \frac{10}{p_1 + 2} - 5p_2$  and  $D_2 = 400 - 2p_1 + \frac{7}{p_2 + 3}$ , where  $p_1$  and  $p_2$  are the respective prices of the products. Are the products competitive, complementary, or neither? Give an example of two products that might behave this way.

5. Using four rectangles, *estimate* the area under the curve  $y = \frac{3}{x}$  between  $x = 1$  and  $x = 7$ . Then find the *exact* area.

6. Calculate  $\int_4^{\infty} e^{-x/2} dx$ .

7. Suppose a rectangular container with volume 288 cubic feet is to be built. If the bottom of the container costs \$5 per square foot and the top and sides each cost \$3 per square foot to construct, find the minimum cost of the container.