

NAME \_\_\_\_\_

Math 1212  
Test 4  
Fall 2015

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 tomorrow afternoon.

1. Find the area of the region bounded by the curves  $y = x^3 + 3x^2$  and  $y = 4x$ . Be sure to sketch a graph first!

2. Compute both first-order partial derivatives of  $f(x, y) = \frac{xy^2}{x^2y^3 + 1}$ .

3. Find and classify the critical points of  $f(x, y) = 4xy - 2x^4 - y^2 + 4x - 2y$ .

4. Suppose  $p_1$  and  $p_2$  are the prices of two products. Also suppose  $D_1(p_1, p_2) = 2000 + \frac{100}{p_1 + 2} - 25p_2$  and  $D_2(p_1, p_2) = 1500 - \frac{p_2}{p_1 + 7}$  are the demand functions for the two products (quantities). Are the two products competitive (substitutes) or complementary? Give an example of two products which might behave in this way.

5. Using four rectangles, approximate the area between  $f(x) = x^3$  and the  $x$ -axis for  $0 \leq x \leq 2$ . Be sure to draw a picture!

6. Calculate  $\int_0^{\infty} x e^{-x^2} dx$ .

7. A manager has \$60,000 to spend on development and promotion of a new product. If  $x$  thousand dollars are spent on development and  $y$  thousand dollars are spent on promotion,  $f(x, y) = 20x^{\frac{3}{2}}y$  units of the product will be sold. How should the budget be allocated in order to maximize sales?