NAME______________________________

Math 12
Test 4
Spring 2010

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 bounded by $y = x^3 - 4x^2 + 3x$ and the x-axis. Be sure to sketch a graph first!

2. For $f(x, y) = \dfrac{\ln(x^2 + 5)}{y}$, find all four second-order partial derivatives. Do NOT simplify.

3. Find and classify the critical points of $f(x, y) = x^3 - 3xy + y^2 + y - 5$.

4. Suppose p_1 and p_2 are the prices of two products. Also suppose $D_1(p_1, p_2) = \dfrac{100}{p_1\sqrt{p_2}}$ and $D_2(p_1, p_2) = \dfrac{500}{p_2\sqrt[3]{p_1}}$ are the demand functions for the two products (quantities). Answer the following questions, showing your work below.

   a) Are these two products competitive (substitutes), complementary, or neither? (show work)

   b) An example of two products that might behave this way are

   ______________________ and ______________________.

5. Using six rectangles, ***estimate*** the area under the curve $y = (x-1)^2$ between $x = 1$ and $x = 4$. Then find the ***exact*** area.

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

7. Suppose that a firm produces x units of one part and y units of another needed to make a final product, and the total number of finished items produced is given by $P = 12x + 20y - x^2 - 2y^2$. It costs \$4 to produce a unit of the first part, and \$8 to produce a unit of the second part. Under a budget constraint of \$88, what is the largest number of *final products* that can be produced?