NAME_____

Math 12
Test 4
Fall 2012

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 $y = x^3$ and $y = 9x$. Be sure to sketch a graph first!

2. Find all four second-order partial derivatives of $f(x, y) = e^{x^2 y}$. Do NOT simplify.

3. Find and classify the critical points of $f(x,y)=\frac{1}{3}x^3+y^2-2x+2y-2xy$.

4. Suppose two products have demand equations $D_1=\frac{100}{p_1\sqrt{p_2}}$ and $D_2=\frac{500}{p_2\sqrt[3]{p_1}}$, 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 $y = 10x - x^2$ between $x = 1$ and $x = 7$. Then find the ***exact*** area.

6. Calculate $\int_1^{\infty} \frac{x^2}{\left(x^3+2\right)^2} dx$.

7. A computer company has a monthly advertising budget of \$60,000. Its marketing department estimates that if x dollars are spent each month on advertising in electronic media and y dollars per month are spent on television advertising, then the monthly sales will be $S = 90x^{\frac{1}{4}}y^{\frac{3}{4}}$ dollars. If profit is 10% of sales, less the advertising cost, determine how to allocate the advertising budget in order to maximize monthly profit.