NAME_____

Math 1212
Test 4
Spring 2016

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 the curves $y = 8 - x^2$, $y = x^2$, and $y = 7x$ in the first quadrant. Be sure to sketch a graph first! The region should use all three functions as its edges, and only be located in the first quadrant.

2. For $f(x,y) = 8x^3 + 2x^2y^2 + 5y^4$, show that $f_{xy}(x,y) = f_{yx}(x,y)$.

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

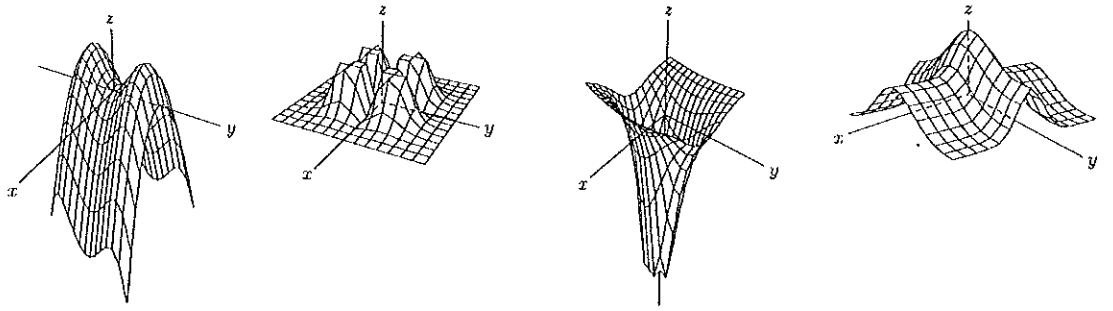
4. Suppose p_1 and p_2 are the prices of two products. Also suppose $D_1(p_1, p_2) = 1000 - 50p_1 + 2p_2$ and $D_2(p_1, p_2) = 500 + 4p_1 - 20p_2$ are the demand functions for the two products (quantities). Answer the following questions, showing your work below.

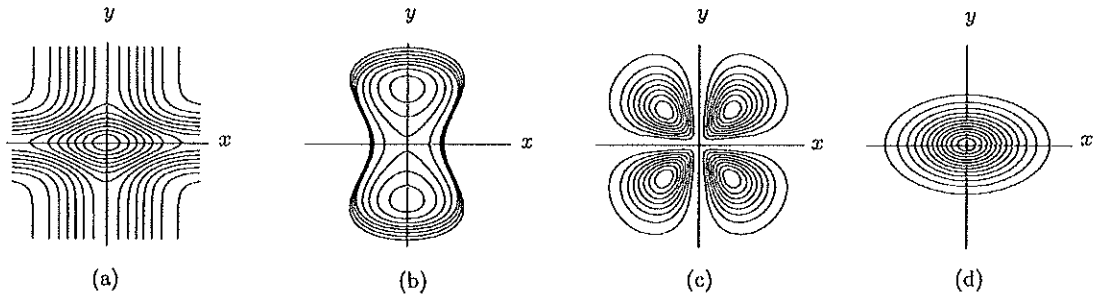
   a) If the price of product 1 goes up by a dollar, the demand for product 2 will go up/down (circle one) by _____ units.

   b) If the price of product 2 goes up by a dollar, the demand for product 1 will go up/down (circle one) by _____ units.

   c) These two products are competitive/complementary/neither (circle one). An example of two products that might behave this way are _____ and _____.

5. For each three-dimensional surface below, determine the matching set (a, b, c, or d) of level curves in the xy-plane.





6. Calculate $\int_1^{\infty} e^{1-x}\,dx$.

7. Suppose a firm has an order for 200 units of its product and wishes to distribute its manufacture between two plants. Suppose x units will be produced at the Minneapolis location and y units will be produced at the Chicago location. If the total cost function is given by $C(x, y) = 2x^2 + xy + y^2 + 200$, how many units should be produced at each location in order to minimize cost?