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. Use calculus to find the area of the region bounded by the curves $y = -\dfrac{3}{2}x + 3$, $x = 3$, and the coordinate axes. Be sure to sketch a graph first.

2. For $f(x, y) = e^{x^2 y}$, show that $f_{xy}(x, y) = f_{yx}(x, y)$.

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
$D_1(p_1, p_2) = 500 + \dfrac{10}{p_1 + 2} - 5p_2$ and $D_2(p_1, p_2) = 400 - 2p_1 + \dfrac{7}{p_2 + 3}$ are the
demand functions for the two products (quantities). Determine whether these two
products are competitive, complementary, or neither. Then give an example of
two products that might behave in this way.

5. For each three-dimensional surface below, determine the matching equation (a, b, c, d, or e).
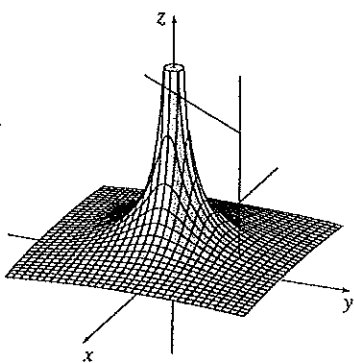
a) $z = x^2 + y^2$

b) $z = y^2 - x^2$

c) $z^2 - y^2 - x^2 = 1$

d) $\dfrac{x^2}{16} + \dfrac{y^2}{25} + \dfrac{z^2}{4} = 1$
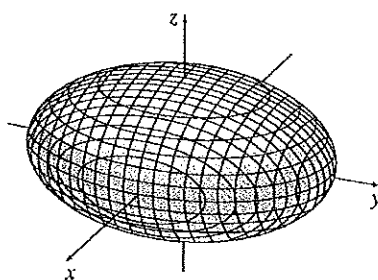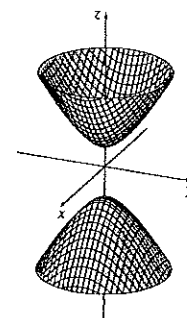
e) $z = 5(x^2 + y^2)^{-\frac{1}{2}}$
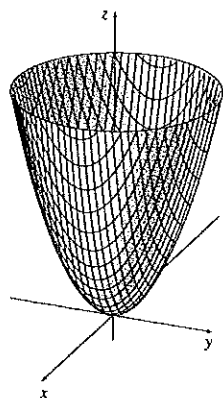
equation_____   equation_____
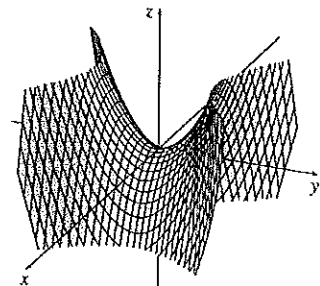
equation_____   equation_____   equation_____

6. Calculate $\displaystyle\int_0^\infty 5e^{-2x}\,dx$.

7.   Postal regulations require that to avoid oversize rates, the length plus the girth (distance around) of a box-shaped package must not exceed 108 inches. What dimensions will maximize the volume of a rectangular package that is within the size limit?