

NAME _____

Math 12
Test 4
Spring 2011

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.

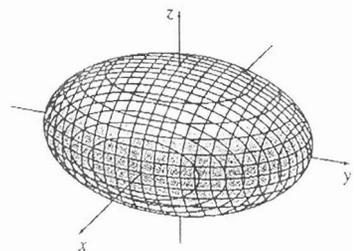
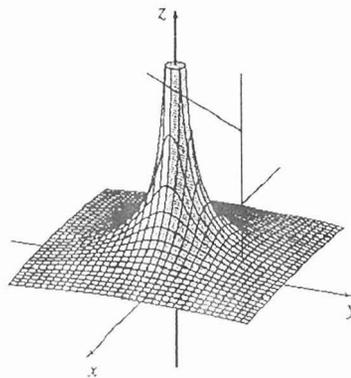
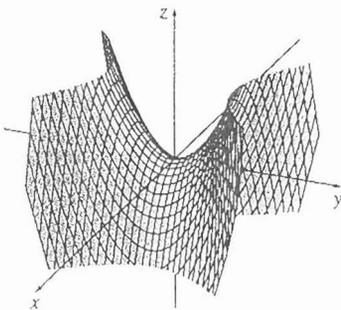
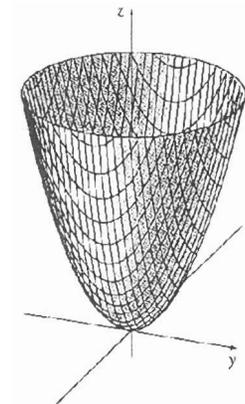
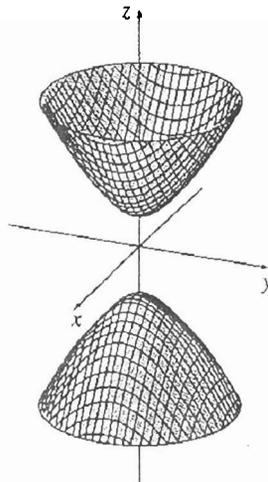
1. Find the area of the region bounded by $y = x^3 - 3x^2$ and $y = 4x$. Be sure to sketch a graph first!

2. Find the first-order partial derivatives of $f(x, y) = 5x \ln(x^2 + y)$. Do NOT simplify.

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

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



5. Using four rectangles, *estimate* the area under the curve $y = x^2$ between $x = 1$ and $x = 3$. Then find the *exact* area.

6. Calculate $\int_1^{\infty} \frac{1}{x^2} dx$.

7. If x thousand dollars is spent on labor and y thousand dollars is spent on equipment, the output at a factory will be $Q = 60x^{\frac{1}{3}}y^{\frac{2}{3}}$ units. If \$120,000 is available how should this money be allocated between labor and equipment to generate the largest possible output?