

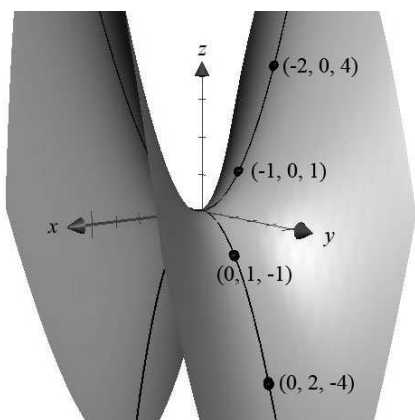
Name: \_\_\_\_\_

Math 206: Fall 2011  
Exam 1: October 7

Please write your final answer in the space provided. **For full credit you must show your work.**  
Use correct vector notation even in your work. Good Luck!

1. (8 points) Describe and sketch the three-dimensional graph of  $f(x, y) = 1 - 2x$ .

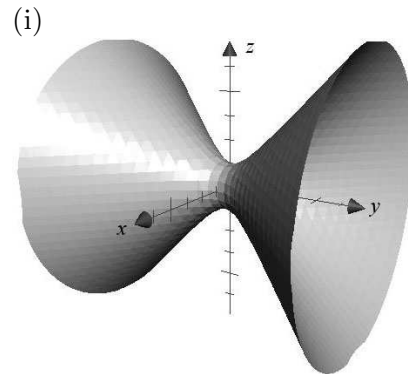
2. (7 points) Write the equation of the quadric surface pictured. The dark curves and the points pictured lie on the surface.



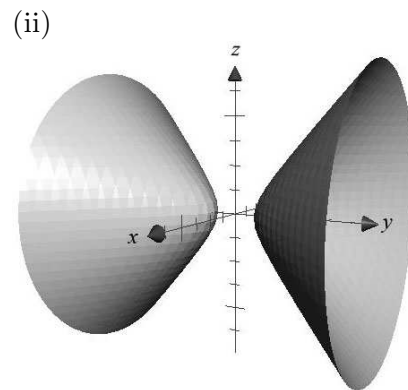
(2) \_\_\_\_\_

3. (12 points) Match each equation with its graph. Explain your choices.

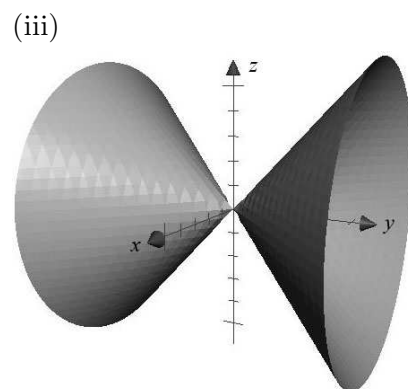
(a)  $x^2 - y^2 + z^2 = -1$



(b)  $x^2 - y^2 + z^2 = 0$



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



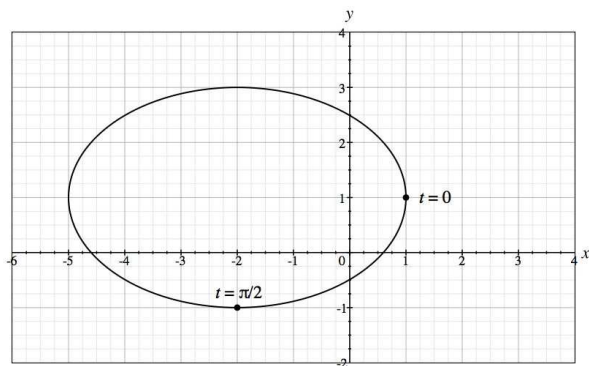
4. Three vertices of a parallelogram are  $A = (1, 2, -1)$ ,  $B = (3, 1, 0)$ , and  $C = (-2, 3, 1)$ .

(a) (7 points) The fourth vertex is opposite  $B$ . Find it. (4a) \_\_\_\_\_

(b) (7 points) Find the measure of  $\angle ABC$ . (4b) \_\_\_\_\_

(c) (7 points) Find  $\text{proj}_{\overline{BC}} \overline{BA}$ . (4c) \_\_\_\_\_

5. (8 points) Write the parametrization for the ellipse pictured. Where the marked points correspond to the indicated values of  $t$ .



(5) \_\_\_\_\_

6. (7 points) Find the point where the line  $\vec{x}(t) = (2t+1)\hat{i} + (t)\hat{j} + (-t-1)\hat{k}$  and the plane  $2x+3y-z = 6$  intersect.

(6) \_\_\_\_\_

7. (9 points) Plane  $P$  contains the point  $\vec{r} = (1, 2, -3)$  and the line  $\vec{x}(t) = (2t-3)\hat{i} + (-t-1)\hat{j} + (9)\hat{k}$ . Find the equation of plane  $P$ .

(7) \_\_\_\_\_

8. The position of a particle is given by  $\vec{r}(t) = \sin t \hat{i} + e^t \hat{j} + (t - 1) \hat{k}$ .

(a) (7 points) Find the position of the particle when  $t = \pi/2$ . (8a)\_\_\_\_\_

(b) (7 points) For what value of  $t$  is the particle in the  $xy$ -plane? (8b)\_\_\_\_\_

(c) (7 points) Find the vector function that represents the particle's velocity.

(8c)\_\_\_\_\_

(d) (7 points) Find the parametric equation of the line tangent to the path when  $t = \pi/2$ .

(8d)\_\_\_\_\_