Math 173 - Quiz 3

February 10, 2011

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Find the distance from the point $\underbrace{(1,1,-3)}_{Q}$ to the plane described by the equation $2x - 3y + 8z = 6$.

P IS A POINT ON THE PLANE: $P(3,0,0)$.

NORMAL VECTOR $\vec{N} = 2\hat{\imath} - 3\hat{\jmath} + 8\hat{k} \Rightarrow$

$\vec{PQ} = -2\hat{\imath} + \hat{\jmath} - 3\hat{k}$

DISTANCE $= \dfrac{|\vec{PQ} \cdot \vec{N}|}{|\vec{N}|}$

$= \dfrac{|-31|}{\sqrt{77}} = \boxed{31/\sqrt{77}}$

2. (2 points) Identify the quadric surface described by each equation.

(a) $\dfrac{y^2}{4} = \dfrac{x^2}{16} + 4z^2$ CONE

(b) $2x^2 + 4y^2 + 8z^2 = 14$ ELLIPSOID

(c) $\dfrac{y^2}{4} - x^2 - \dfrac{z^2}{8} = 1$ HYPERBOLOID OF TWO SHEETS

(d) $z = x^2 + 4y^2$ PARABOLOID

3. (2 points) Choose any one of the quadric surfaces above and describe one of its non-trivial level curves (contours).

(d) LET $z = 1$. WE GET $x^2 + 4y^2 = 1$, WHICH DESCRIBES AN ELLIPSE.

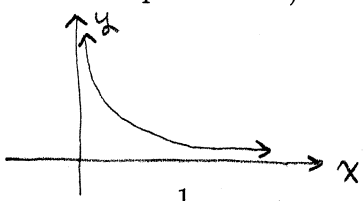
4. (3 points) Consider the vector-valued function $\vec{r}(t) = \sqrt{t}\,\hat{\imath} + \dfrac{1}{t}\,\hat{\jmath}$.

(a) What is the domain of $\vec{r}$? $\{t : t > 0\}$

(b) Draw a rough sketch of the graph of $\vec{r}$. (Hint: Eliminate the parameter.)

$x = \sqrt{t}$

$y = \dfrac{1}{t} \Rightarrow y = \dfrac{1}{x^2}, \; x > 0$



(c) How would your graph change if we changed $\vec{r}$ to $\vec{r}(t) = \sqrt{t}\,\hat{\imath} + \dfrac{1}{t}\,\hat{\jmath} + 2\hat{k}$?

SAME GRAPH, BUT NOW IN THE PLANE $z = 2$.