Math 114 HW 1

due Wednesday, 5/25

1. Find the radius of the sphere : $x^2 + y^2 + z^2 - 2x - 4y - 10z = 19$

2. For the pair of vectors $\mathbf{v}$ and $\mathbf{w}$, where $\mathbf{v} = \hat{\mathbf{i}} - \hat{\mathbf{k}}$ and $\mathbf{w} = \hat{\mathbf{j}} + \hat{\mathbf{k}}$, find the angle θ between $\mathbf{v}$ and $\mathbf{w}$.

3. An insect in the X-Y plane crawls 50 units along the positive direction of the x axis and then crawls 70 units in a direction that is at an angle of 60 degrees (counterclockwise) from the X- axis. Find the vector that gives the final position of the insect.

4. (Fall 2008) Which of the following equations in x and y is equivalent to the statement that the vectors

$$A = \langle x + y, 1, y \rangle \text{ and } B = \langle 1, x - y, -1 \rangle$$

   are perpendicular to each other?

   (a) 2x-y = 0
   (b) x-2y = 0
   (c) x-y = 0
   (d) 2x+y=0
   (e) x + 2y = 0
   (f) None of the above

5. Find the area of the parallelogram whose vertices are P_1, P_2, P_3 and P_4.

$$P_1 = (0,0,0); \ P_2 = (1,2,4); \ P_3 = (3,1,6); \ P_4 = (2,-1,2)$$

6. (Spring 2011) The set of points equidistant from the points $(2, -1, 1)$ and $(4, 3, -5)$ is a plane. What is the equation of this plane?

7. (Fall 2011) Let L be the line through the origin that is perpendicular to the plane $2x + y + z = 7$. Find the distance between the point $(-4, 3, 5)$ and L.

8. (Fall 2008) Let $\mathbf{v} = \langle 0, 7, 0 \rangle$ and let $\mathbf{u}$ be a vector of length 5 which starts at the origin and lies in the X-Y plane. Find the maximum value of the length of the vector $|\mathbf{u} \times \mathbf{v}|$.