Math 143 Set 11

1. Draw the points in $\mathbb{R}^3$ represented by these relations:

a. $x^2 + z^2 \leq 3$

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

c. $x^2 + y^2 + z^2 - 6x + 4y - 2z = 11$

d. $4x^2 + z^2 = 1$.

2. The vector $\mathbf{v}$ lies in the first quadrant of $\mathbb{R}^2$, has $|\mathbf{v}| = 4$, and makes an angle of $\pi/3$ with the x-axis. Write $\mathbf{v}$ as $\langle a, b \rangle$ for some real numbers a and b.

3. Find two unit vectors that have dot product with both $\langle 1, 1, 1 \rangle$ and $\langle 2, 1, 0 \rangle$ equal to 0.

4. Do the following operations on the vectors $\mathbf{u} = \langle 3, 1, 2 \rangle$, $\mathbf{v} = \langle 2, 0, -1 \rangle$, and $\mathbf{w} = \langle 1, 1, 1 \rangle$:

a. Find a vector in the same direction as $\mathbf{u} + \mathbf{v}$ but has length 2.

b. Find the angle between $\mathbf{u}$ and $\mathbf{v}$ and the angle between $\mathbf{u}$ and $\mathbf{w}$.