

Math 53 - Multivariable Calculus

Quiz # 2

September 8th, 2011

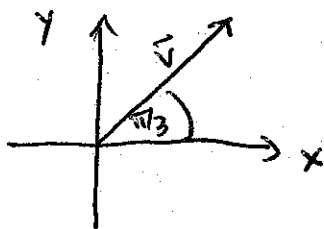
Solns

Exercise 1. Find equations of the sphere with center $(2, -3, 6)$ that touches the xy -plane.

Since sphere touches xy -plane, its radius is the distance from its center $(2, -3, 6)$ to xy plane which is 6. Hence, $r=6$ and the eqⁿ is

$$(x-2)^2 + (y+3)^2 + (z-6)^2 = 6^2 = 36$$

Exercise 2. Suppose the vector \vec{v} lies in the first quadrant of \mathbb{R}^2 and makes an angle $\pi/3$ with the positive x -axis and that $|\vec{v}| = 4$, find \vec{v} in component form.



$$v_1 = |\vec{v}| \cos(\pi/3) = 4 \cdot \frac{1}{2} = 2$$

$$v_2 = |\vec{v}| \sin(\pi/3) = 4 \cdot \frac{\sqrt{3}}{2} = 2\sqrt{3}$$

$$\Rightarrow \vec{v} = \langle 2, 2\sqrt{3} \rangle$$

Exercise 3. For what values of b are the vectors $\langle -6, b, 2 \rangle$ and $\langle b, b^2, b \rangle$ orthogonal?

$$\langle -6, b, 2 \rangle \perp \langle b, b^2, b \rangle \Leftrightarrow \langle -6, b, 2 \rangle \cdot \langle b, b^2, b \rangle = 0$$

$$\Leftrightarrow b^3 - 6b + 2b = 0 \Leftrightarrow b^3 - 4b = 0 \Rightarrow b(b^2 - 4) = 0$$

$$\Rightarrow b = 0, 2, -2.$$