

Show all work!

1. Determine whether either of these equations represent a sphere. If they do, find the center and radius of the sphere.

(a) $x^2 + y^2 + z^2 - 4x + 2y - 6z + 25 = 0$

(b) $x^2 + y^2 + z^2 - 4x + 2y - 6z - 22 = 0$

2. Describe the region Ω :

$$\Omega = \{(x, y, z) : x \geq 0, z \geq 0, x^2 + y^2 + z^2 \leq 16\} \quad (1)$$

3. If $P = (2, 3, 5)$ and $Q = (1, 5, 7)$, find \vec{PQ} and its norm.

4. if $\mathbf{a} = (2, 1, 5)$, $\mathbf{b} = (-1, 1, 3)$, and $\mathbf{c} = (1, 2, 8)$, find:

(a) $2\mathbf{a} - 3\mathbf{b} + \mathbf{c}$

(b) $\mathbf{a} + \mathbf{b} + \mathbf{c}$.

5. Find α to make $2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ and $-4\mathbf{i} + \alpha\mathbf{j} - 8\mathbf{k}$ parallel.