

- (1) Are the following points inside, outside, or on the sphere of radius 2, centered at $(1, 1, 1)$, in \mathbb{R}^3 ?
- (i) $(2, 2, 2)$

(ii) $(-1, 0, -1)$

- (2) Show that the equation represents a sphere, and find its center and radius.

$$x^2 + y^2 + z^2 - 4x - 6y - 8z + 13 = 0$$

- (3) Find an equation of the sphere, centered at $(2, -3, 6)$, that touches the yz -plane.

(4) Find the distance between the spheres $x^2 + y^2 + z^2 = 4$ and $x^2 + y^2 + z^2 = 4x + 4y + 4z - 11$.

(5) Explain the set of points $(x, y, z) \in \mathbb{R}^3$ such that

$$x^2 + y^2 + z^2 \leq 1 \quad \text{and} \quad z \geq 0$$

(6) Explain the set of points $(x, y, z) \in \mathbb{R}^3$ such that

$$1 \leq x^2 + y^2 + z^2 \leq 9$$

(7) Determine whether the points lie on straight line.

$$A(2, 4, 2), B(3, 7, -2), C(1, 3, 3)$$