

## Section 12.1 Three-Dimensional Coordinate Systems

**Example 1** Plot  $(1, 2, 3)$ ,  $(-3, 4, -5)$  and  $(1, -3, 2)$ .

**Example 2**

- What is the equation for  $xy$  - plane?
- What is the equation for  $xz$  - plane?
- What is the equation for  $yz$  - plane?

**Example 3** What surfaces in  $R^3$  are represented by the following equations?

a.  $z = 3$

b.  $y = 5$

**Distance between two points**  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  is  
$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

**Example 4** Find the distance between  $(1, -2, 3)$  and  $(-2, 3, 1)$ .

An equation of a **sphere** with center  $(0, 0, 0)$  and radius  $r$  is  $x^2 + y^2 + z^2 = r^2$ .

An equation of a sphere with center  $(a, b, c)$  and radius  $r$  is  
 $(x - a)^2 + (y - b)^2 + (z - c)^2 = r^2$ .

**Example 5** Find the center, radius of  $x^2 + y^2 + z^2 + 6x + 2y - 4z = 11$ .

**Example 6** Describe the following region  $R$ .

a.  $R = \{(x, y, z) : x^2 + y^2 + z^2 > 9\}$

b.  $R = \{(x, y, z) : 0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1\}$

HW: 3, 13, 15, 20, 38.