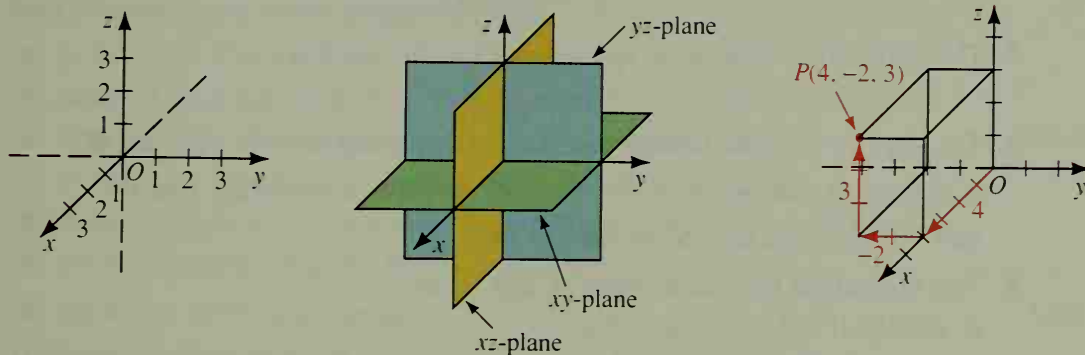


Extra*Points in Space*

To locate points in three-dimensional space, three coordinate axes are needed. Think of the y -axis and z -axis as lying in the plane of the paper with the x -axis perpendicular to the plane of the paper. The axes intersect at the *origin*, or zero point, of each axis. The arrowhead on each axis indicates the positive direction.



The coordinate axes determine three *coordinate planes*, as shown in the middle diagram above. Each point in space has three coordinates: the x -coordinate, y -coordinate, and z -coordinate. For example, point P in the diagram at the right above, has coordinates $(4, -2, 3)$. The red arrows in the figure show that to *graph* P you start at O , move **4** units in the positive direction on the x -axis, **-2** units parallel to the y -axis (that is 2 units in the negative direction parallel to the y -axis), and **3** units in the positive direction parallel to the z -axis.

Exercises

On which axis or axes does each point lie?

1. $(0, 7, 0)$ 2. $(0, 0, -9)$ 3. $(5, 0, 0)$ 4. $(0, 0, 0)$

On which coordinate plane or planes does each point lie?

5. $(1, -3, 0)$ 6. $(-7, 0, -1)$ 7. $(0, 8, 5)$ 8. $(0, 0, 0)$

Graph each point on a coordinate system in space.

9. $(-1, 4, 0)$ 10. $(2, 3, 1)$ 11. $(-2, -3, 4)$ 12. $(0, 1, -5)$

Sketch the triangle in space whose vertices have the given coordinates.

13. $(4, 0, 0)$, $(0, 8, 0)$, $(0, 0, 2)$ 14. $(1, 0, 0)$, $(0, -5, 0)$, $(0, 0, -5)$
 15. $(-3, 0, 0)$, $(0, -4, 0)$, $(0, 0, 6)$ 16. $(0, 0, 0)$, $(3, 0, 3)$, $(0, -4, 5)$