

22. Suppose  $E$  is on  $\overline{PQ}$  and  $PE = \frac{1}{4}PQ$ . If  $P = (x_1, y_1)$  and  $Q = (x_2, y_2)$ , where  $x_1 < x_2$ , show that  $E = \left(\frac{3}{4}x_1 + \frac{1}{4}x_2, \frac{3}{4}y_1 + \frac{1}{4}y_2\right)$ .
- C** 23. Suppose  $F$  is on  $\overline{PQ}$  and  $PF = \frac{3}{8}PQ$ . If  $P = (x_1, y_1)$  and  $Q = (x_2, y_2)$ , where  $x_1 < x_2$ , find the coordinates of  $F$ . (*Hint*: See Exercise 22.)
24. Given points  $P(2, 1)$  and  $D(7, 11)$ , find the coordinates of a point  $T$  on  $\overline{PD}$  such that  $\frac{PT}{TD} = \frac{2}{3}$ .

## Self-Test 1

For each pair of points find (a) the distance between the two points and (b) the midpoint of the segment that joins the two points.

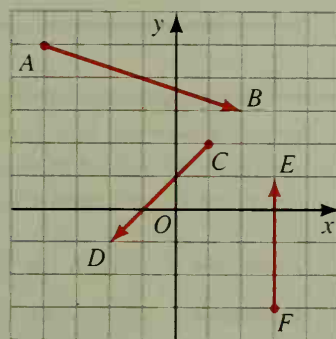
1.  $(5, 1)$  and  $(3, 1)$
2.  $(8, -6)$  and  $(0, 0)$
3.  $(-2, 7)$  and  $(8, -3)$
4.  $(-3, 2)$  and  $(-5, 7)$

Write an equation of the circle described.

5. Center at the origin; radius 9
6. Center  $(-1, 2)$ ; radius 5
7. Find the center and the radius of the circle  $(x + 2)^2 + (y - 3)^2 = 36$ .

Find the slope of the line through the points named.

8.  $(0, 0)$  and  $(7, 4)$
9.  $(-4, 2)$  and  $(1, -1)$
10. For which is slope *not* defined, a horizontal line or a vertical line?
11. Given  $P(3, -2)$  and  $Q(5, 2)$ , find:
  - a. the slope of any line parallel to  $\overleftrightarrow{PQ}$
  - b. the slope of any line perpendicular to  $\overleftrightarrow{PQ}$
12. Name each vector as an ordered pair.
  - a.  $\overrightarrow{AB}$
  - b.  $\overrightarrow{CD}$
  - c.  $\overrightarrow{FE}$
13. Find the magnitude of each vector in Exercise 12.
14. Complete.
  - a.  $(-3, 2) + (7, -11) = \underline{\hspace{1cm}}$
  - b.  $3(4, -1) + (-2)(-5, 3) = \underline{\hspace{1cm}}$
15. If  $M(-3, 7)$  is the midpoint of  $\overline{PQ}$ , where  $P$  has coordinates  $(9, -4)$ , find the coordinates of  $Q$ .



Exs. 12, 13