

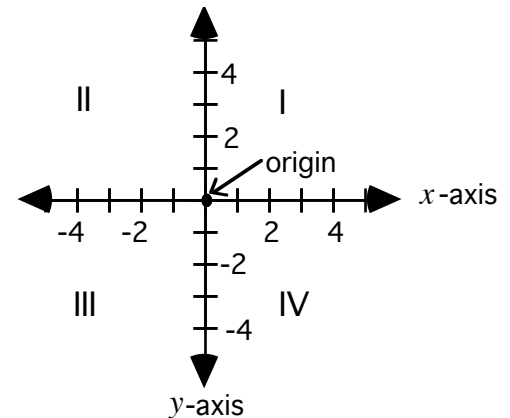
§ 2.1 The Distance and Midpoint Formulas

- an **ordered pair** consists of two numbers where order (or sequence) is important.

Example (1,2) and (2,1) are different ordered pairs.

The Rectangular Coordinate System (or Cartesian coordinate system)

- the rectangular coordinate system has four **quadrants** (I, II, III, IV).
- the point (0,0) is called the **origin**.
- points in the rectangular coordinate system are ordered pairs (x, y) where x and y are the **coordinates** of the point.



Example Plot the points A(4, 3), B(0,-5), C(-2, 1), D(-1, - 4) and E(3, -2).

The Distance Formula:

- the distance between two points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ is : $d(P_1, P_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

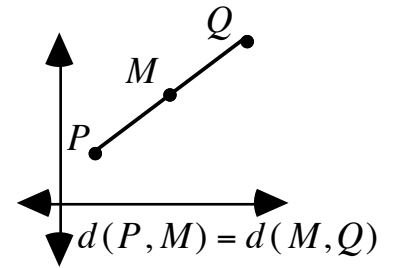
Example Find the distance $d(P_1, P_2)$ given $P_1(- 4, 5)$ and $P_2(3, 2)$.

Midpoint Formula:

- the midpoint of the line segment PQ with endpoints

$P(x_1, y_1)$ and $Q(x_2, y_2)$ is

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$



Note: the midpoint formula gives the coordinates of the midpoint not the distance (length) of it.

Example Find the midpoint of the line segment PQ given $P(-5, 5)$ and $Q(3, 1)$.