

DISTANCE AND MIDPOINT NOTES

OBJECTIVE:

- 1) Calculate distance between two points and find the midpoint of a segment in a coordinate plane.

DISTANCE FORMULA

The distance between (x_1, y_1) and (x_2, y_2) is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

MIDPOINT FORMULA

The midpoint between (x_1, y_1) and (x_2, y_2) is

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

For #1, find:

- the distance between the points. (Simplify the radical)
- the midpoint of the segment that connects the points.

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

$$a) \quad d = \sqrt{(-3-5)^2 + (4-2)^2} = \sqrt{(-8)^2 + 4} = \sqrt{64+4} = \sqrt{68} = \boxed{2\sqrt{17}}$$

$$b) \quad \left(\frac{-3+5}{2}, \frac{4+2}{2} \right)$$
$$\boxed{(1, 3)}$$

Find the value of x if the distance between the two given points is d .

Then sketch the points on the x axis.

2. $(5, 3)$ and $(x, 1)$ $d = \sqrt{22}$

$$\sqrt{(5-x)^2 + (3-1)^2} = \sqrt{22}$$

$$(x-5)^2 + 4 = 22$$

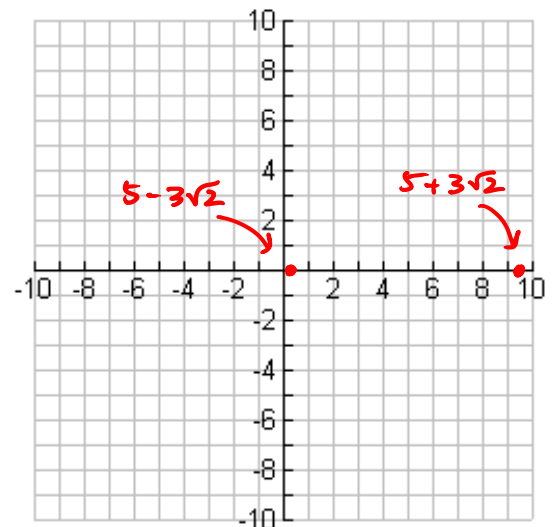
$$(x-5)^2 = 18$$

$$x-5 = \pm \sqrt{18}$$

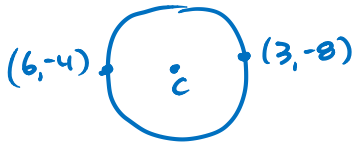
$$\boxed{x = 5 \pm 3\sqrt{2}}$$

$$(5 + 3\sqrt{2}, 1)$$

$$(5 - 3\sqrt{2}, 1)$$



3. \overline{BC} is the diameter of a circle with endpoints B(3, -8) and C(6, -4). Find the center and radius of the circle. Draw a sketch!



Center:

$$\left(\frac{6+3}{2}, \frac{-8+(-4)}{2} \right)$$

$$\left(\frac{9}{2}, -6 \right)$$

$$d = \sqrt{(3-6)^2 + (-8-(-4))^2}$$

$$d = \sqrt{9+16} = 5$$

$$r = \frac{5}{2}$$