

When working with points on the coordinate grid there are 2 very important formulas we need to know!

1. The Distance Formula:  $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$   $A(x_1, y_1)$   
 $B(x_2, y_2)$

Can be used to...

To find the distance between two points  
 To find the length of a segment.

2. The Midpoint Formula:  $M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Can be used to....

To find the midpoint of a segment.  
 To find where a bisector intersects a segment.

### Examples:

Find the distance between the following points!

$x_1, y_1, x_2, y_2$

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

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

$$d = \sqrt{(-1 - 2)^2 + (2 - (-4))^2}$$

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

$$d = \sqrt{9 + 36}$$

$$d = \sqrt{45}$$

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

$$d = 3\sqrt{5}$$

3.  $(0, 4)$  and  $(2, 3)$

$$d = \sqrt{(0 - 2)^2 + (4 - 3)^2}$$

$$d = \sqrt{(-2)^2 + (1)^2}$$

$$d = \sqrt{4 + 1}$$

$$d = \sqrt{5}$$

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

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

$$d = \sqrt{(7)^2 + (-1)^2}$$

$$d = \sqrt{49 + 1}$$

$$d = \sqrt{50}$$

$$d = \sqrt{25} \sqrt{2}$$

$$d = 5\sqrt{2}$$

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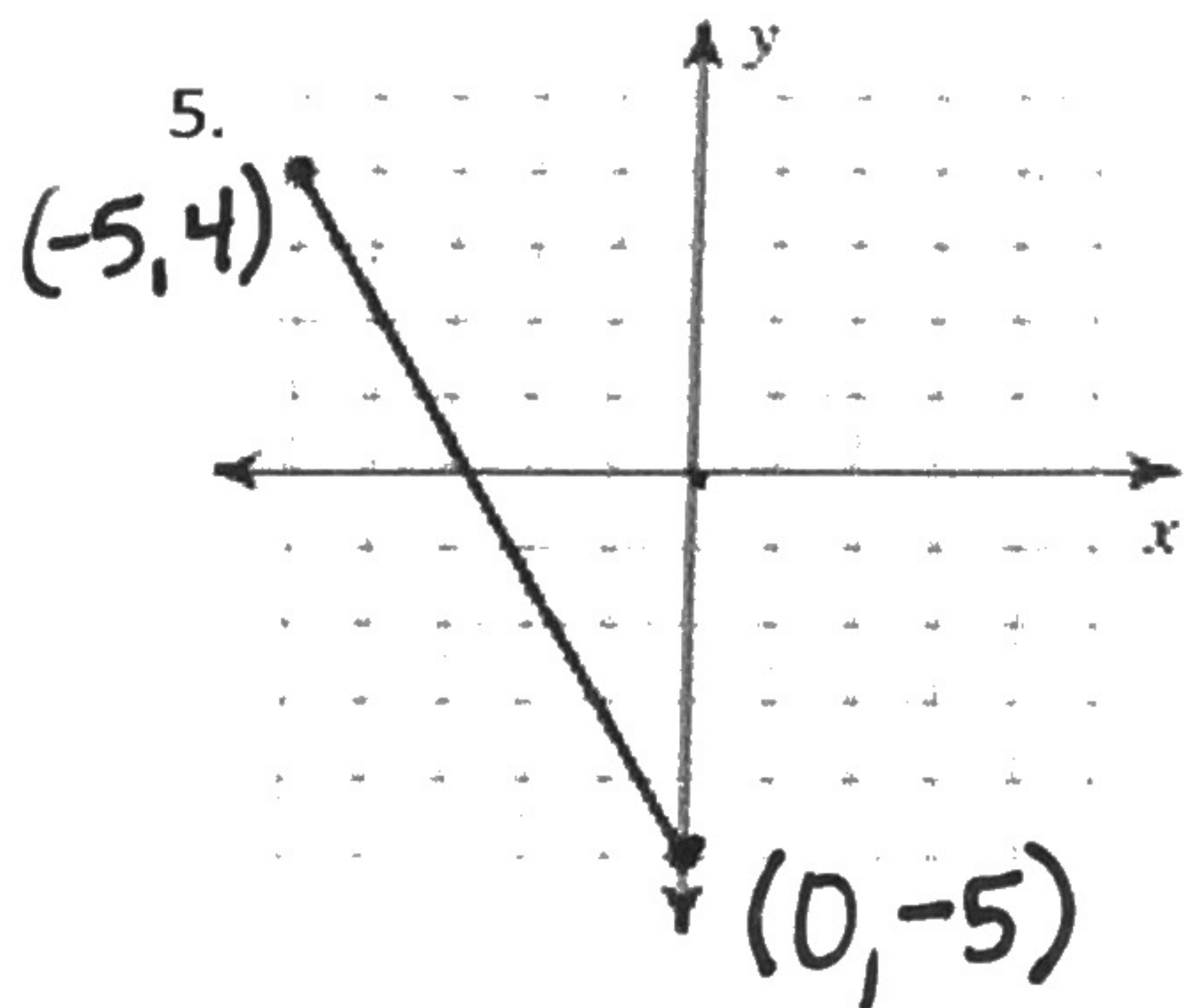
4.  $(4, 0)$  and  $(-4, 1)$

$$d = \sqrt{(4 - (-4))^2 + (0 - 1)^2}$$

$$d = \sqrt{(8)^2 + (-1)^2}$$

$$d = \sqrt{65}$$





$$d = \sqrt{(-5-0)^2 + (4+5)^2}$$

$$d = \sqrt{(-5)^2 + (9)^2} \quad d = \sqrt{106}$$

$$d = \sqrt{25 + 81}$$

Examples:

Find the midpoint of the following points.

1. (4, 2) and (8, 6)  $M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$  2. (5, 2) and (-4, -3)  $M\left(\frac{5-4}{2}, \frac{2-3}{2}\right)$

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

$$M\left(\frac{12}{2}, \frac{8}{2}\right) \Rightarrow \boxed{M(6, 4)}$$

$$\boxed{M\left(\frac{+1}{2}, -\frac{1}{2}\right)}$$

3. (2, -1) and (-6, 0)

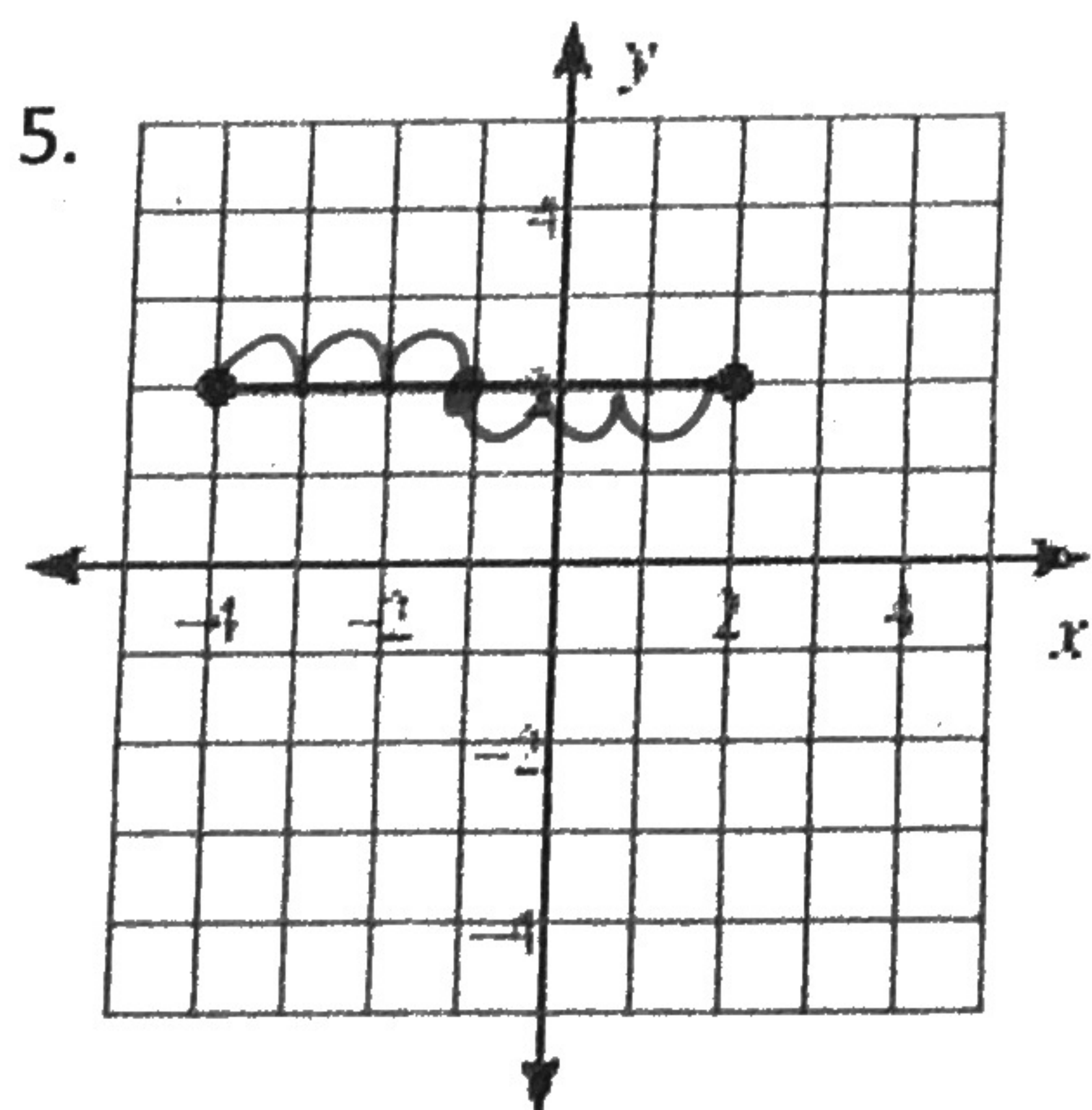
$$M\left(\frac{2-6}{2}, \frac{-1+0}{2}\right)$$

$$M\left(-\frac{4}{2}, -\frac{1}{2}\right) \Rightarrow \boxed{M\left(-2, -\frac{1}{2}\right)}$$

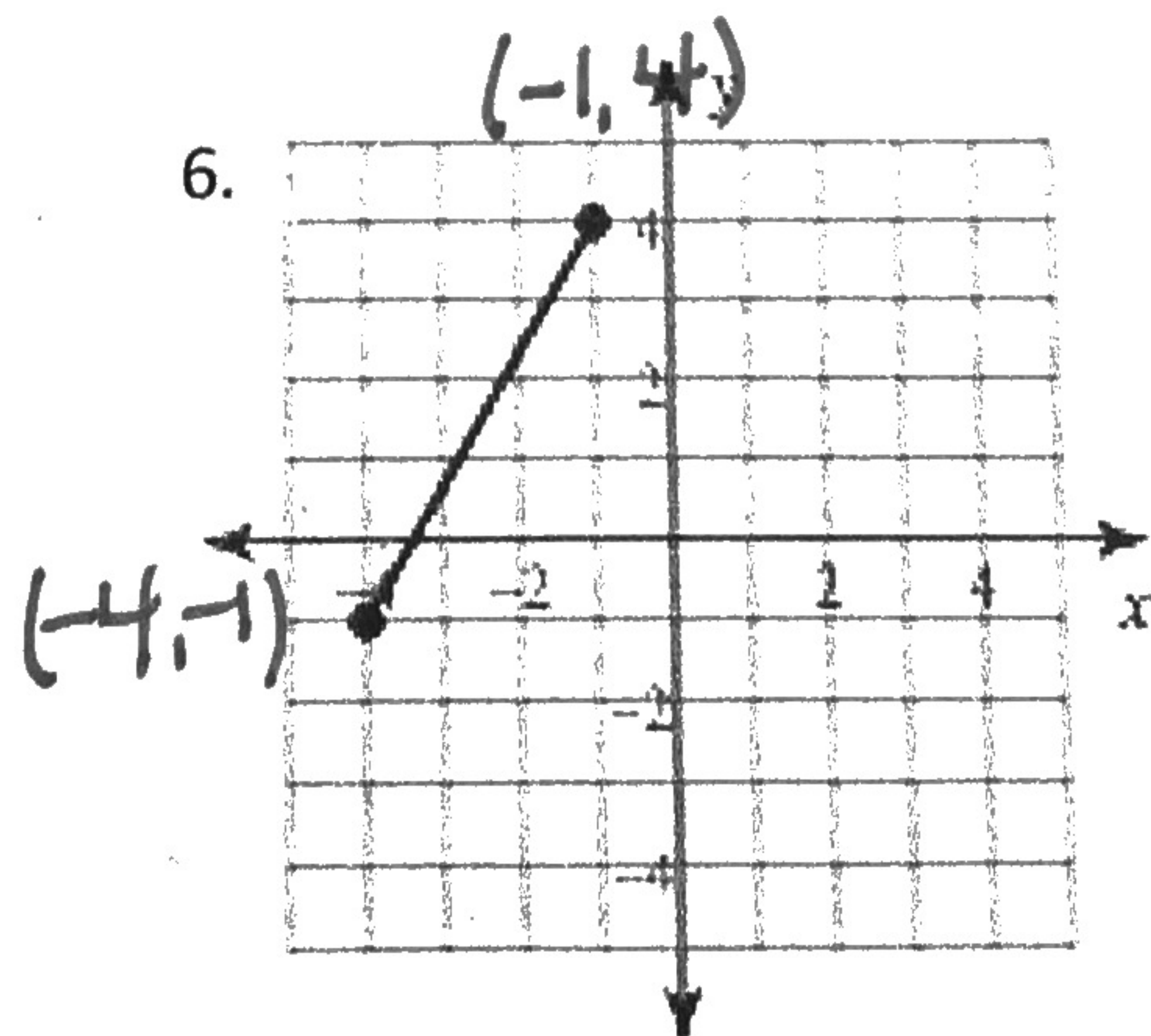
4. (-1, 1) and (5, -5)

$$M\left(\frac{-1+5}{2}, \frac{1-5}{2}\right)$$

$$M\left(\frac{4}{2}, -\frac{4}{2}\right) \Rightarrow \boxed{M(2, -2)}$$



$$M(1, 2)$$



$$M\left(\frac{-4+1}{2}, \frac{-1+4}{2}\right)$$

$$\boxed{M\left(-\frac{3}{2}, \frac{3}{2}\right)}$$