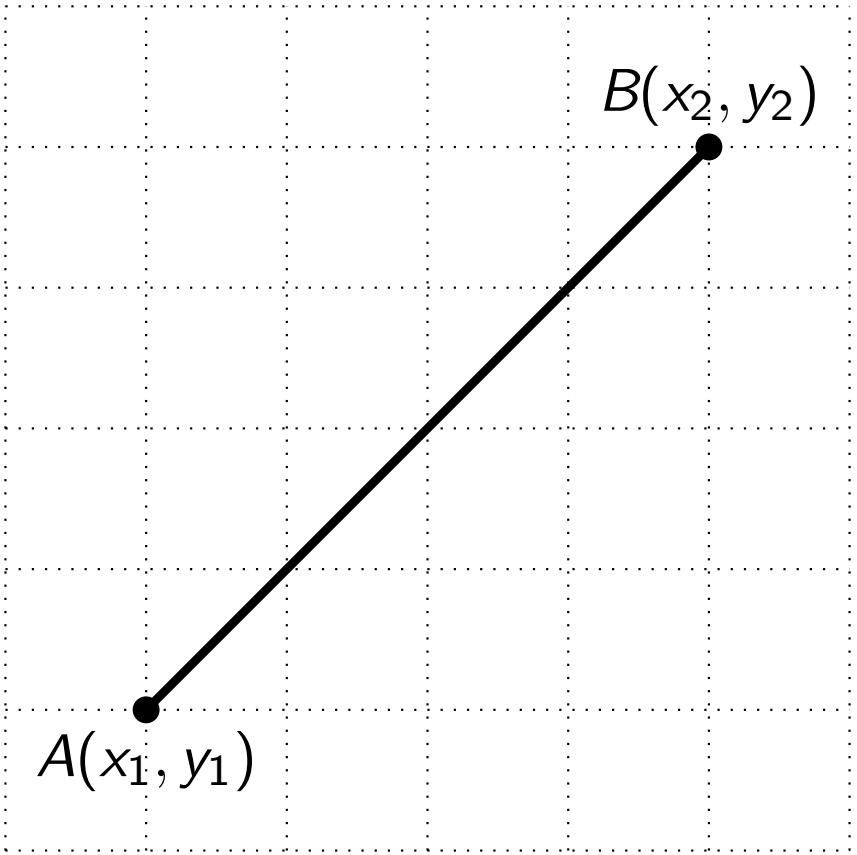
Distance and Midpoint in the Coordinate Plane

Objectives

1. Find the distance between two points in the coordinate plane
2. Find the midpoint between two points in the coordinate plane

Distance in the Coordinate Plane

If we have points $A(x_1, y_1)$ and $B(x_2, y_2)$, then we can use the **Pythagorean Theorem** to find the distance between them.



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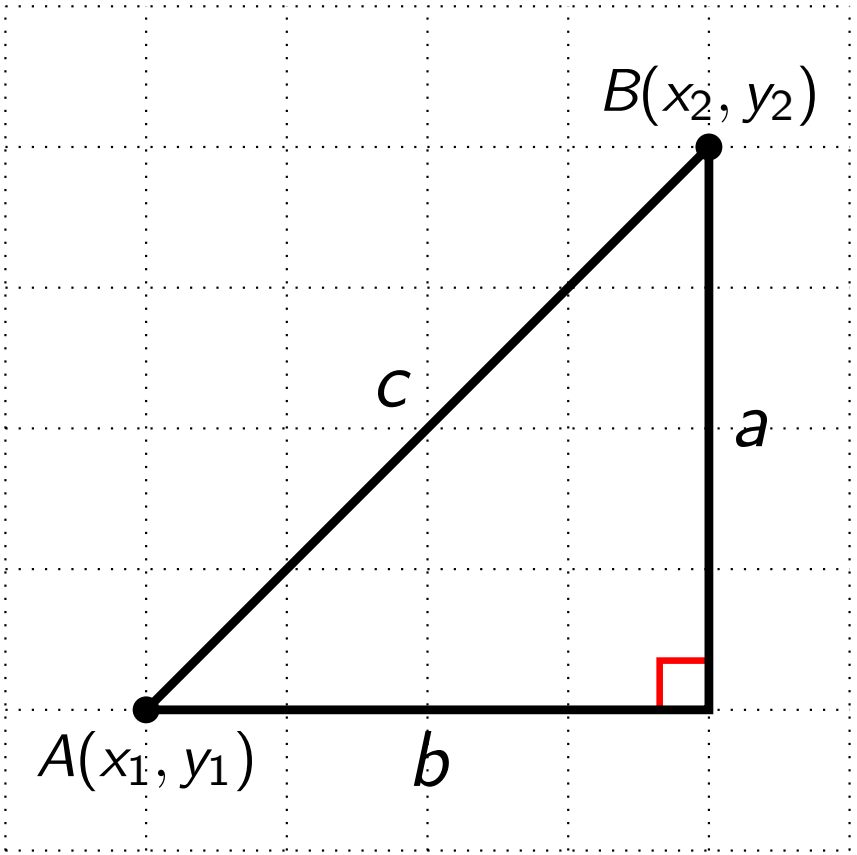

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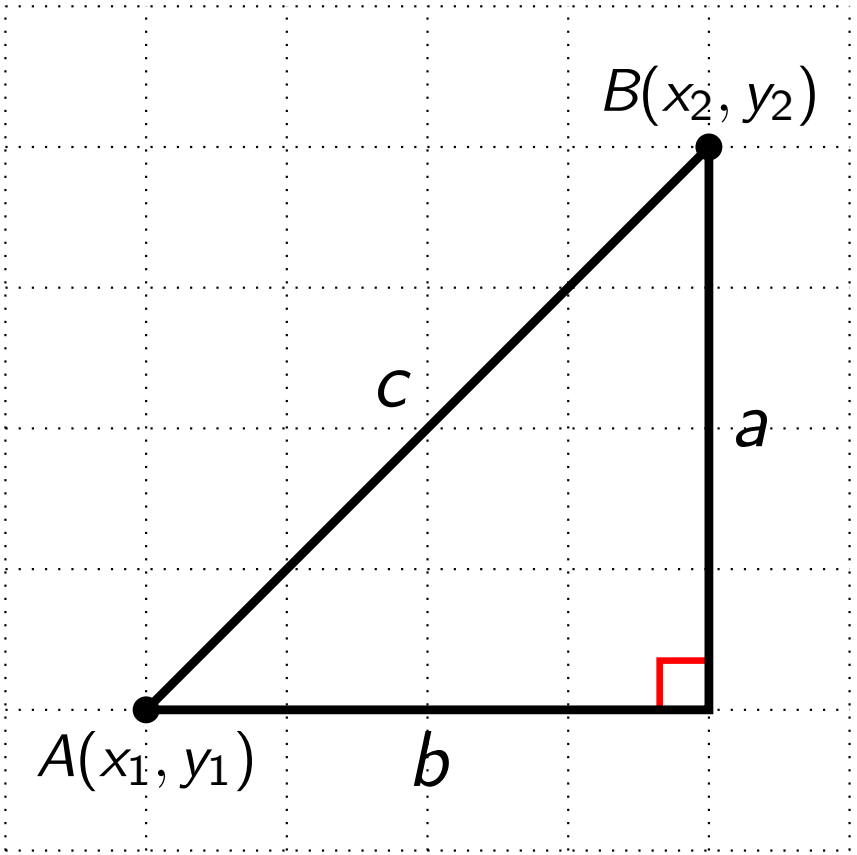

$$c^2 = a^2 + b^2$$

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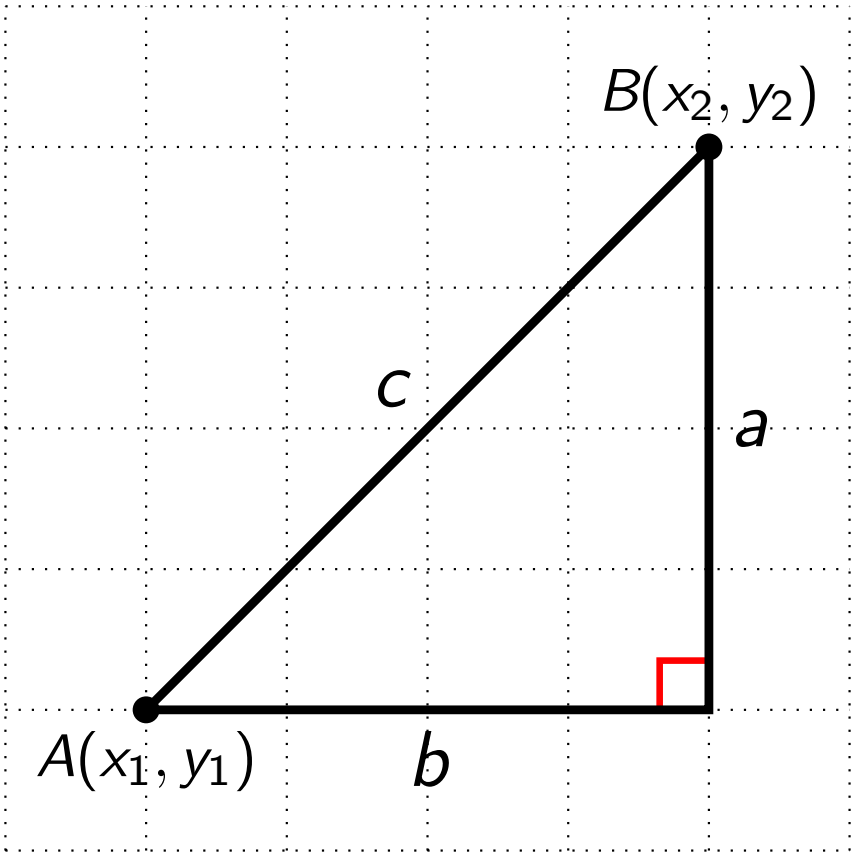

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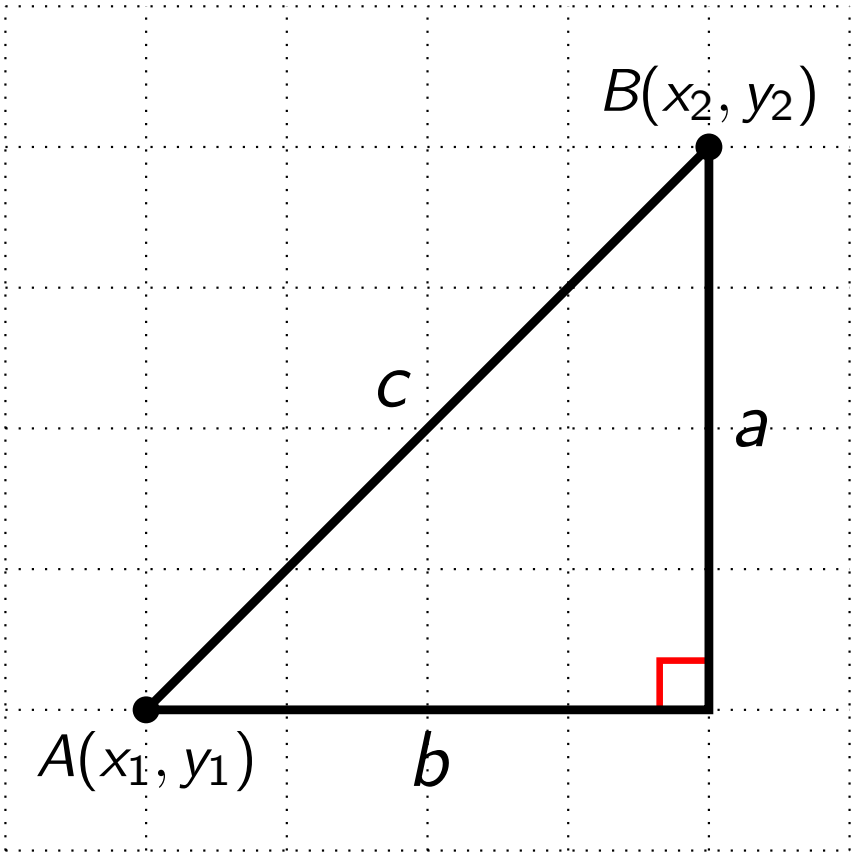

$$c^2 = a^2 + b^2$$

$$c = \sqrt{a^2 + b^2}$$

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

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Find the distance between each pair of points. Round your answers to 2 decimal places.

(a) $(5, 3)$ and $(-4, 7)$

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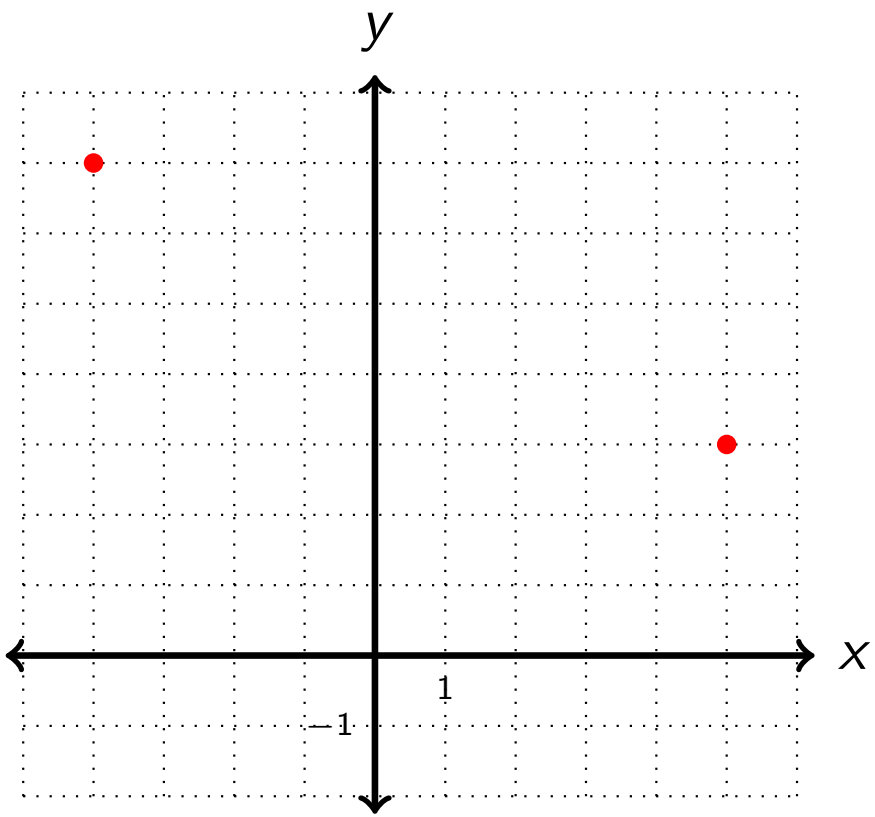

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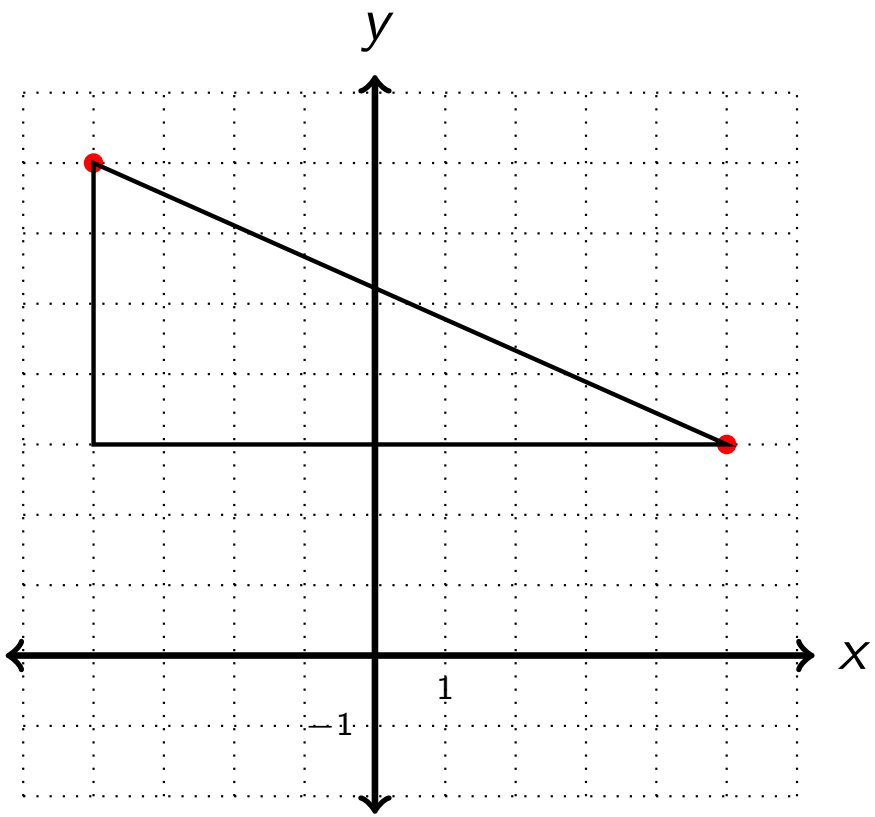

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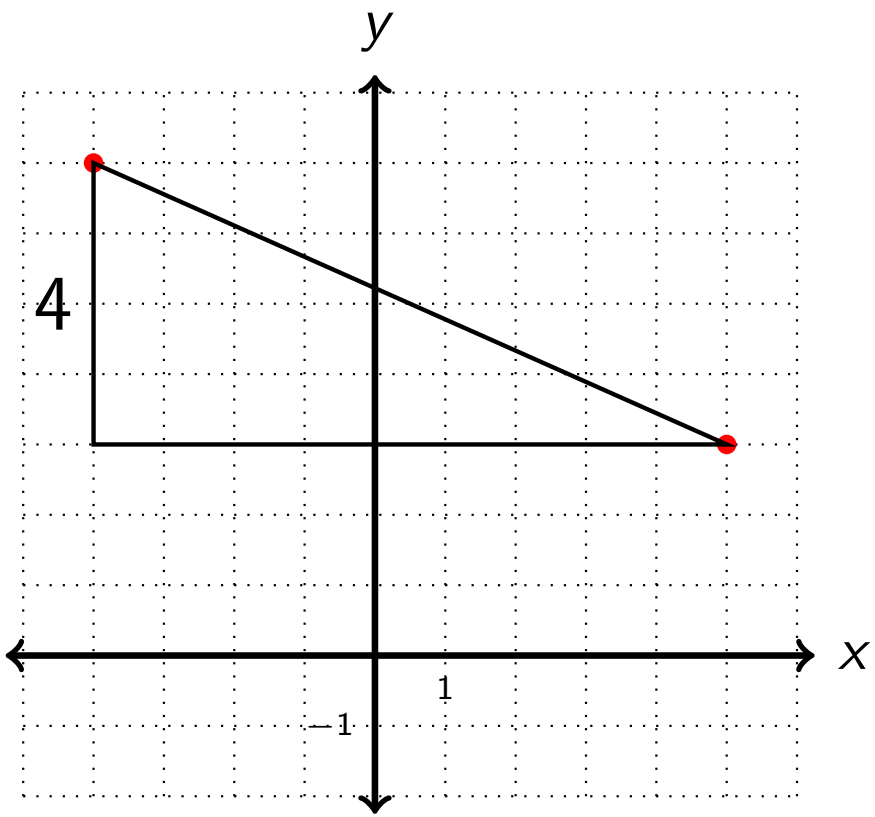

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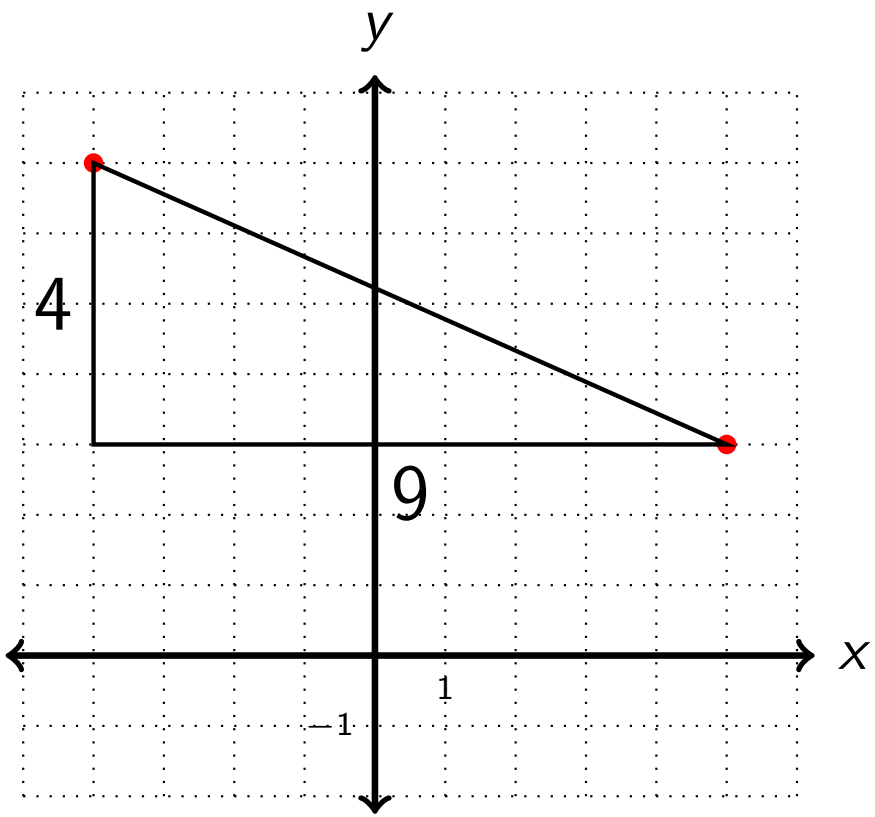

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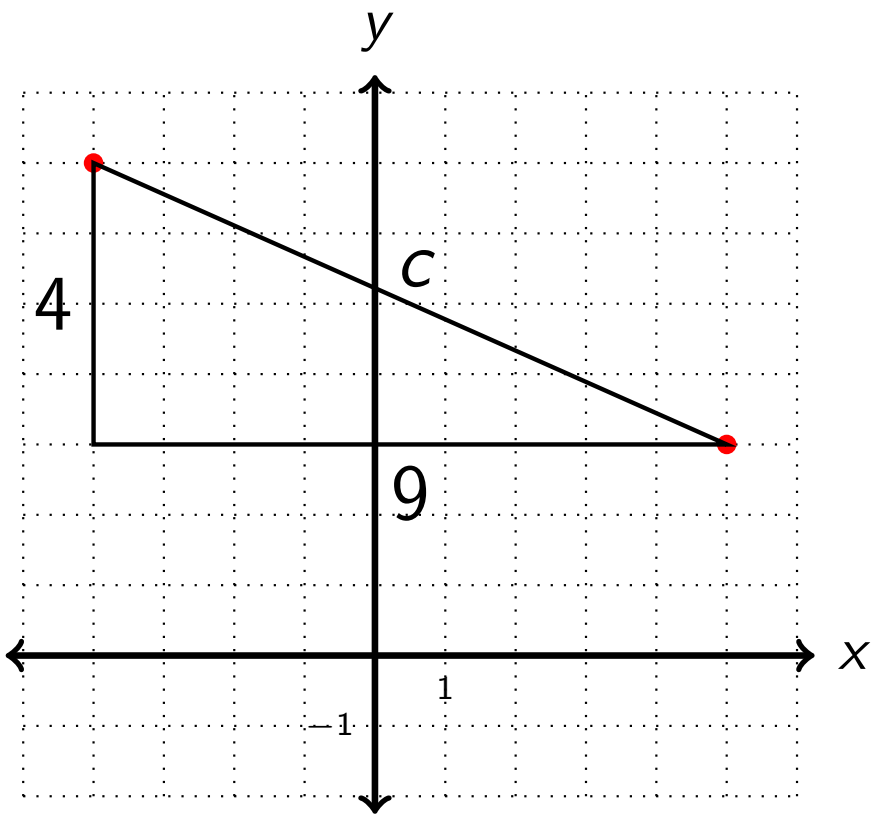

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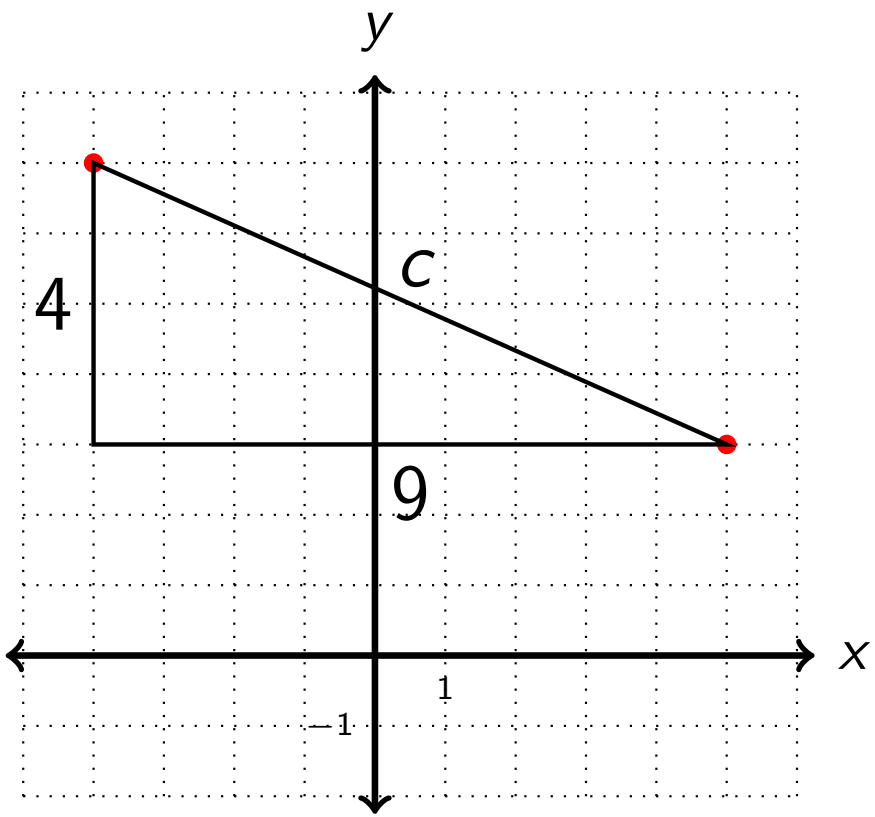

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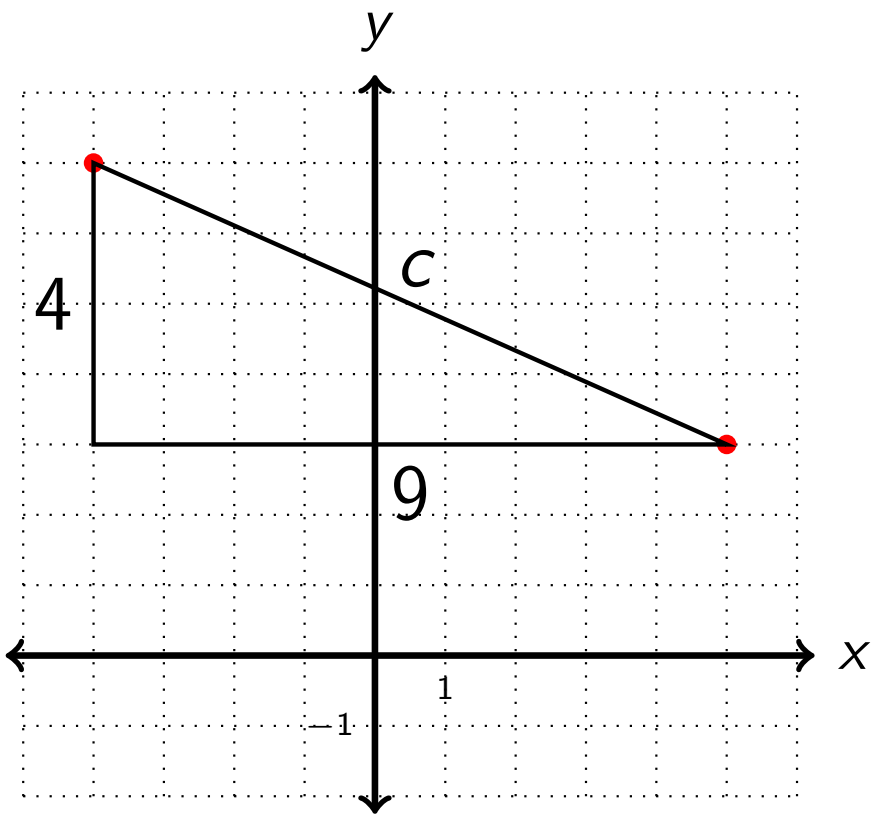

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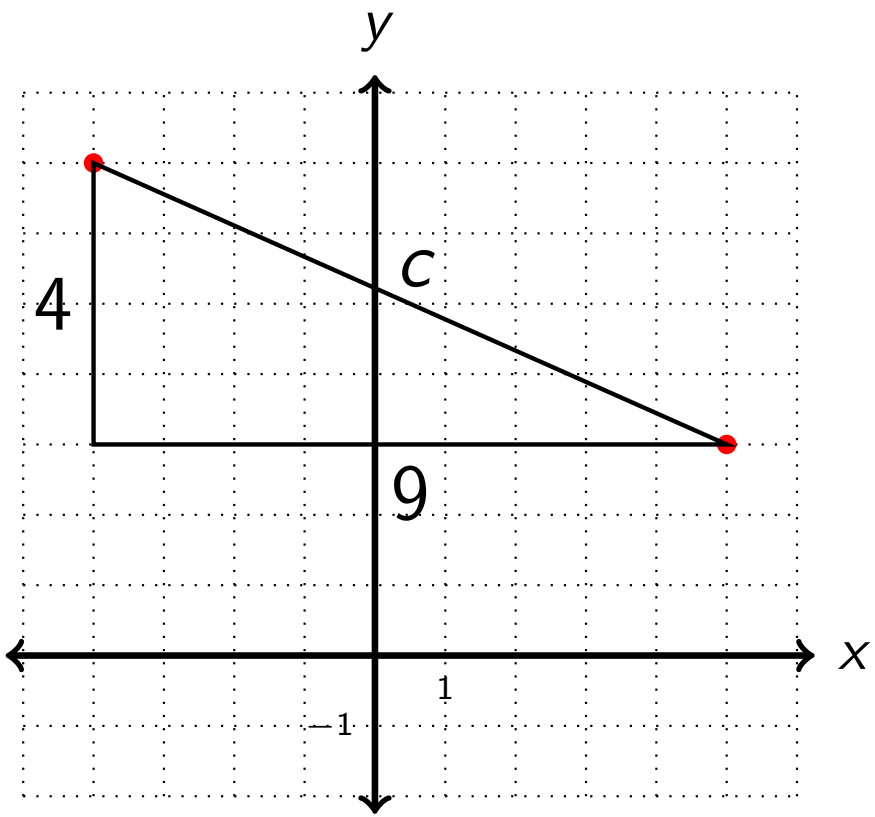

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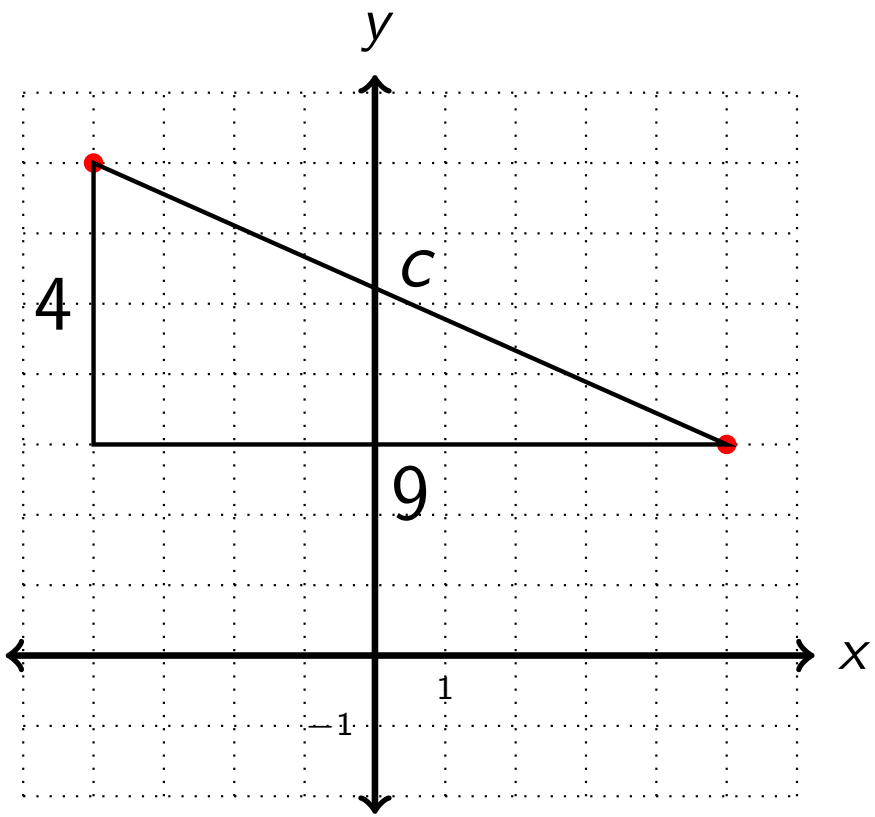

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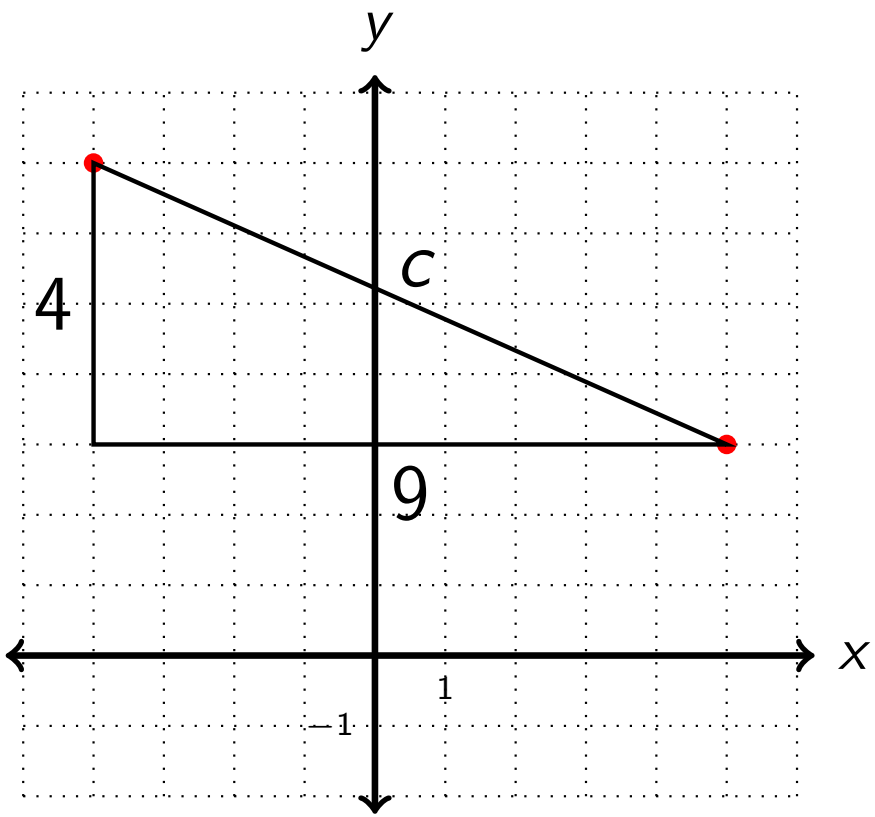

$$c^2 = 4^2 + 9^2$$
$$c^2 = 16 + 81$$
$$c^2 = 95$$
$$c = \sqrt{95}$$
$$c \approx 9.75$$

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(b) $(0, -6)$ and $(3, -1)$

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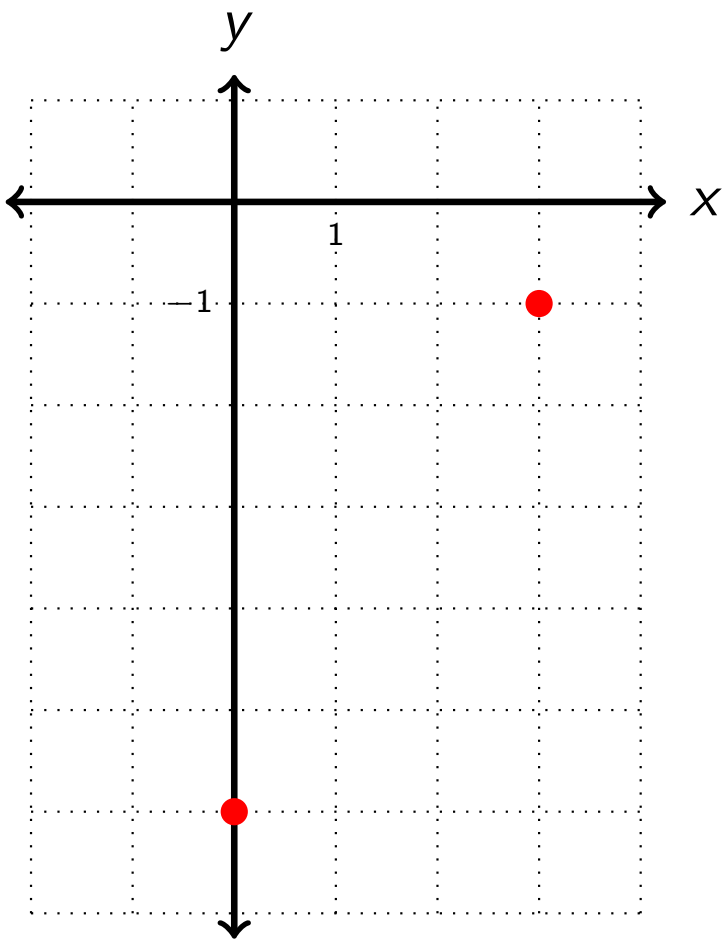

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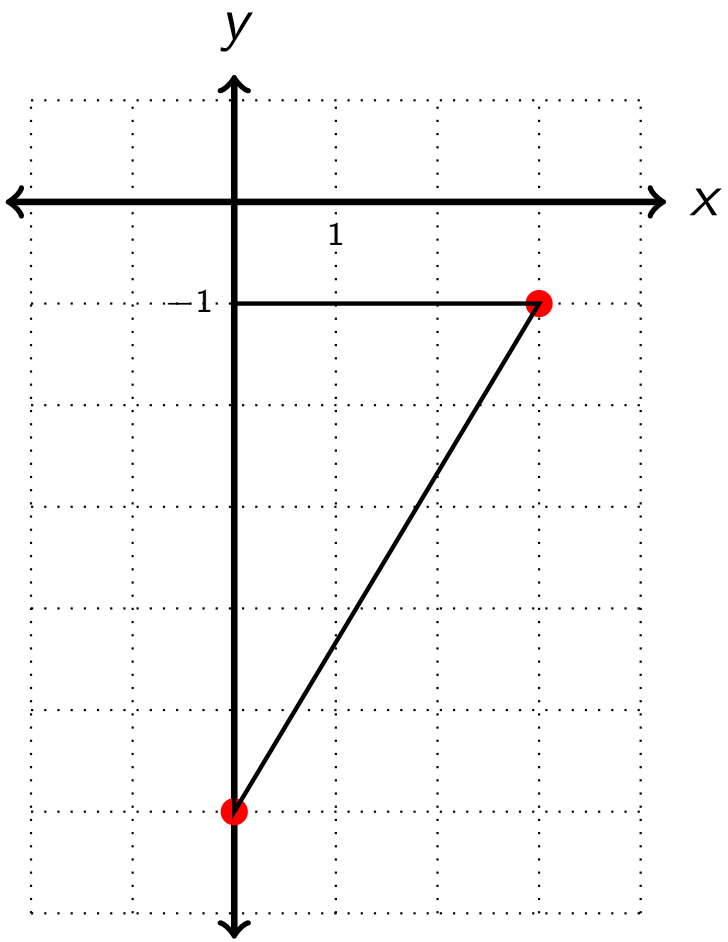

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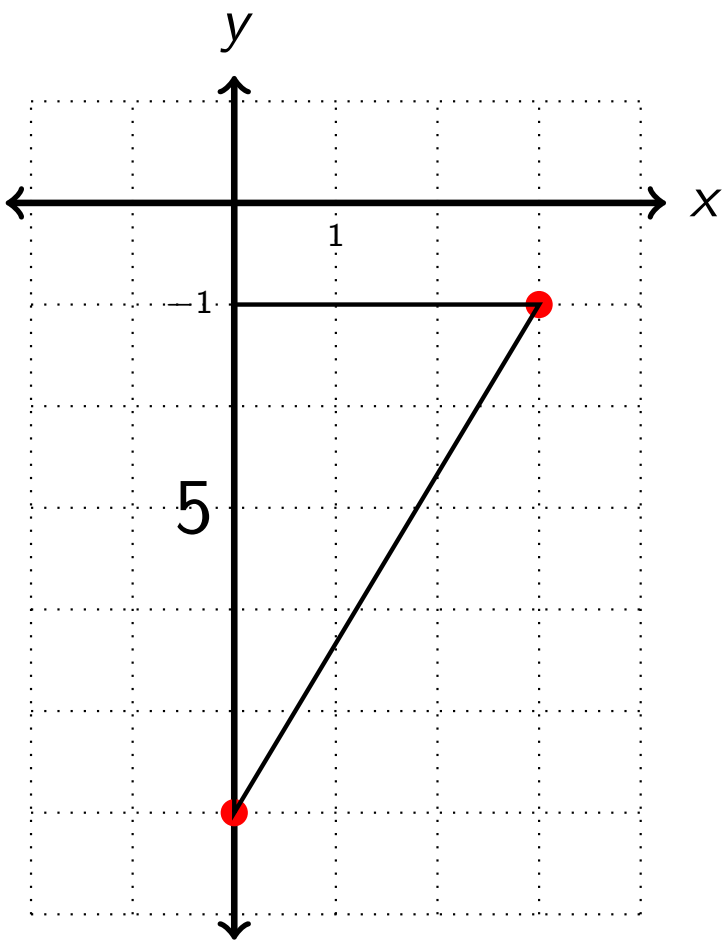

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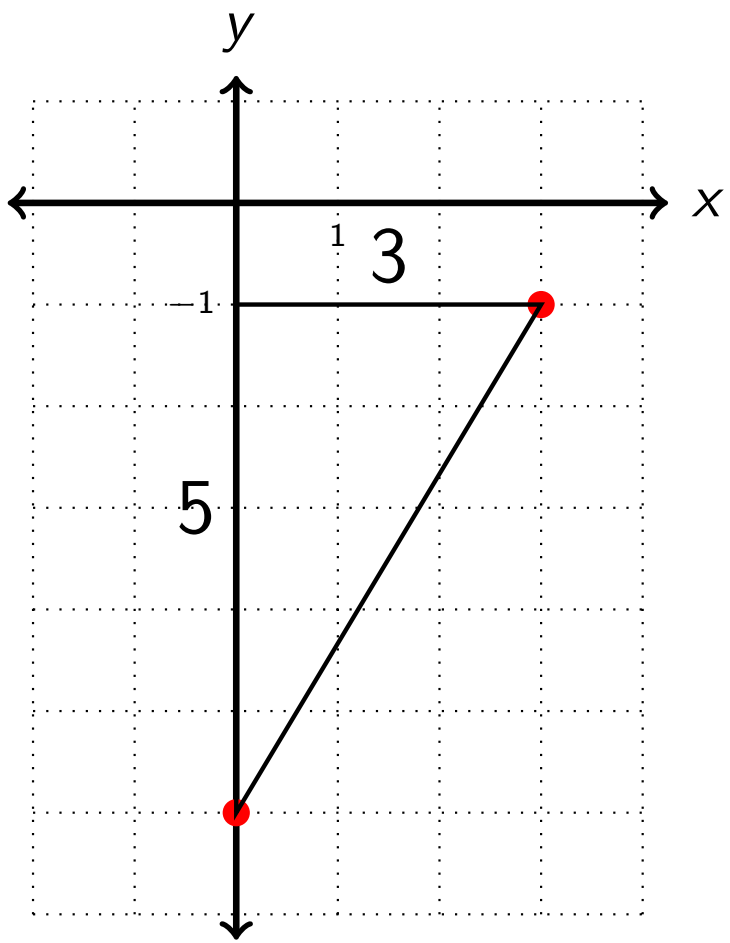

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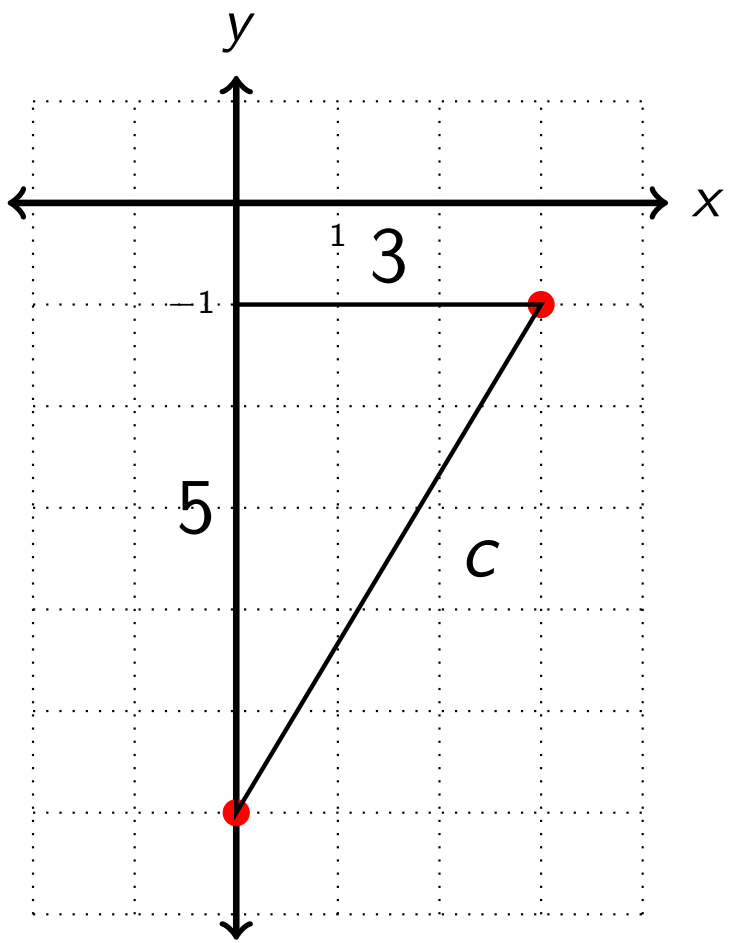

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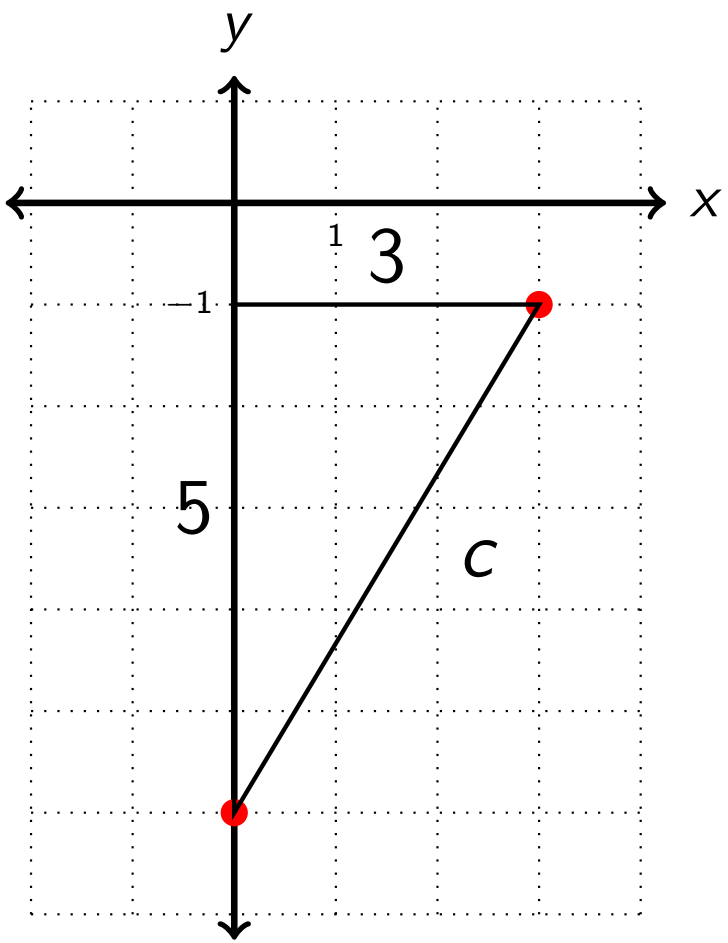

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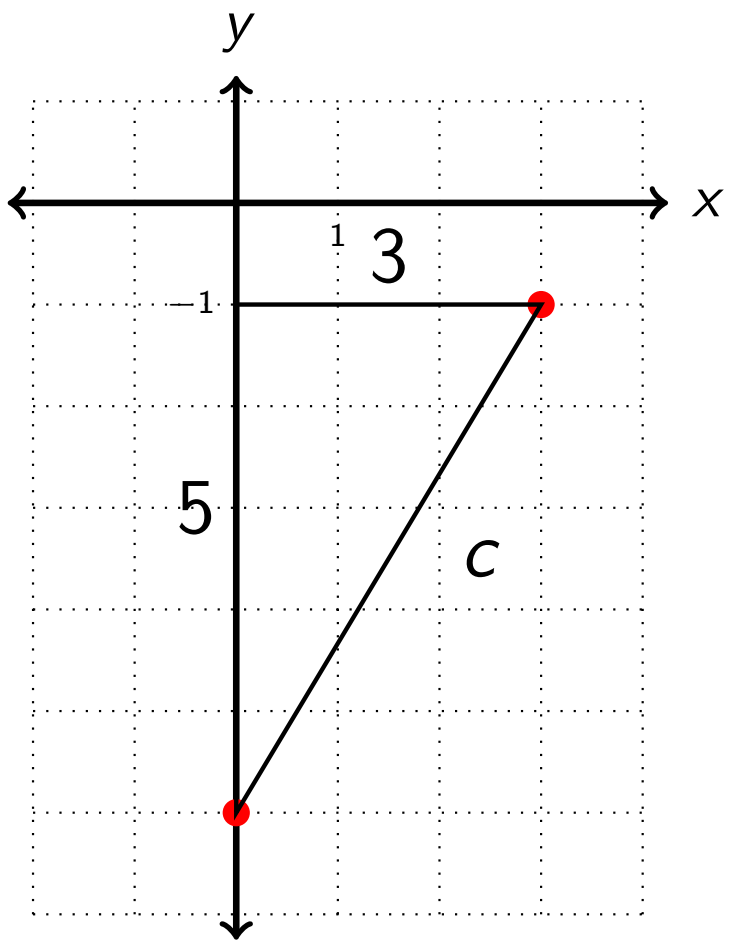

$$c^2 = 3^2 + 5^2$$

$$c^2 = 9 + 25$$

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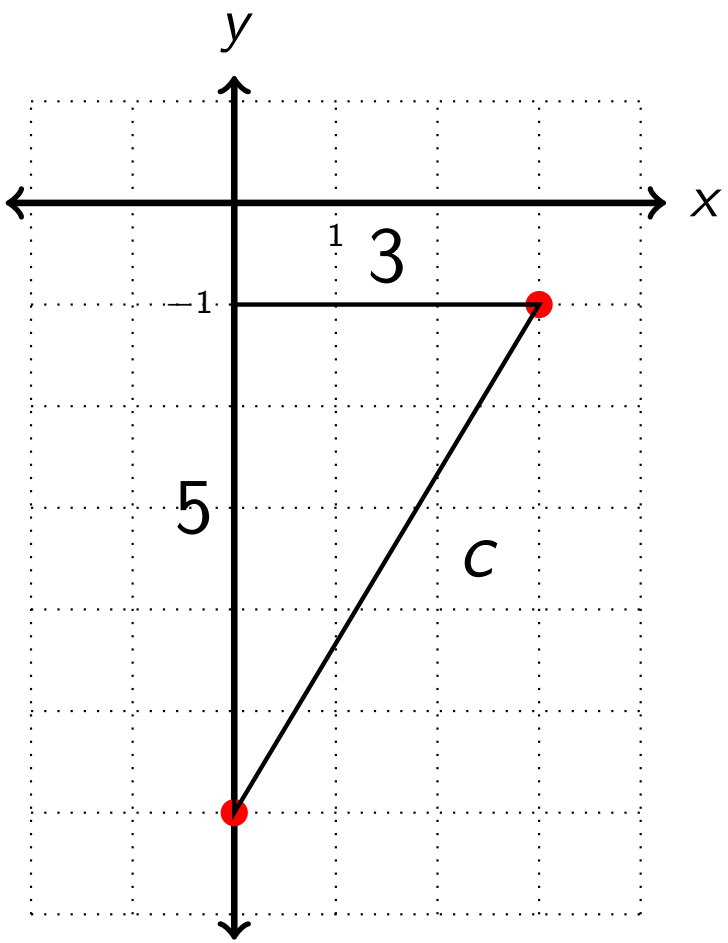

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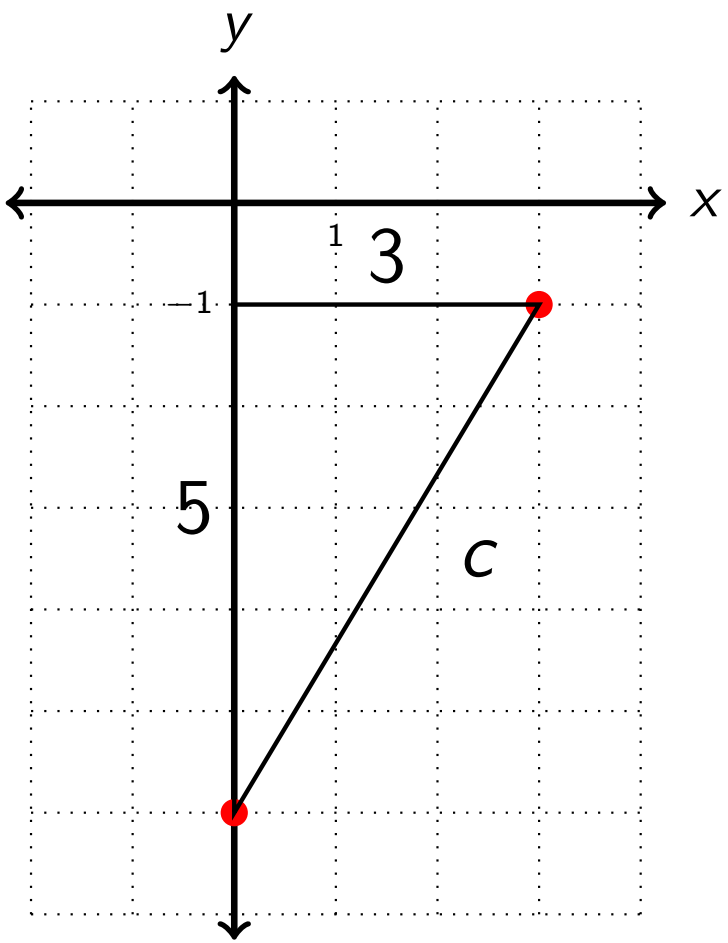

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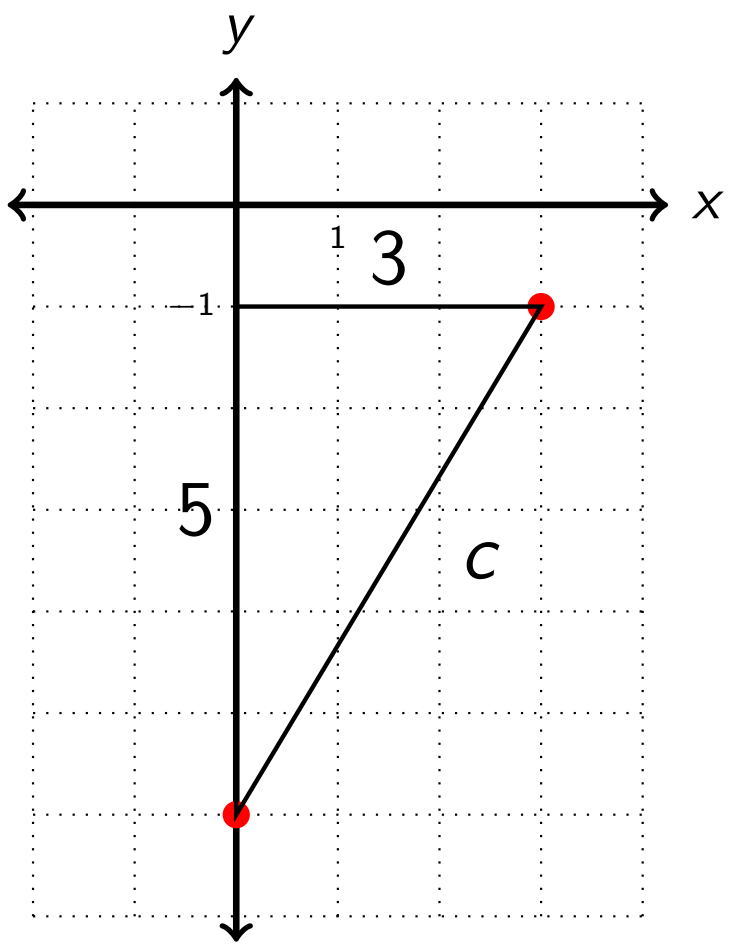

$$c^2 = 3^2 + 5^2$$

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$$c \approx 5.83$$

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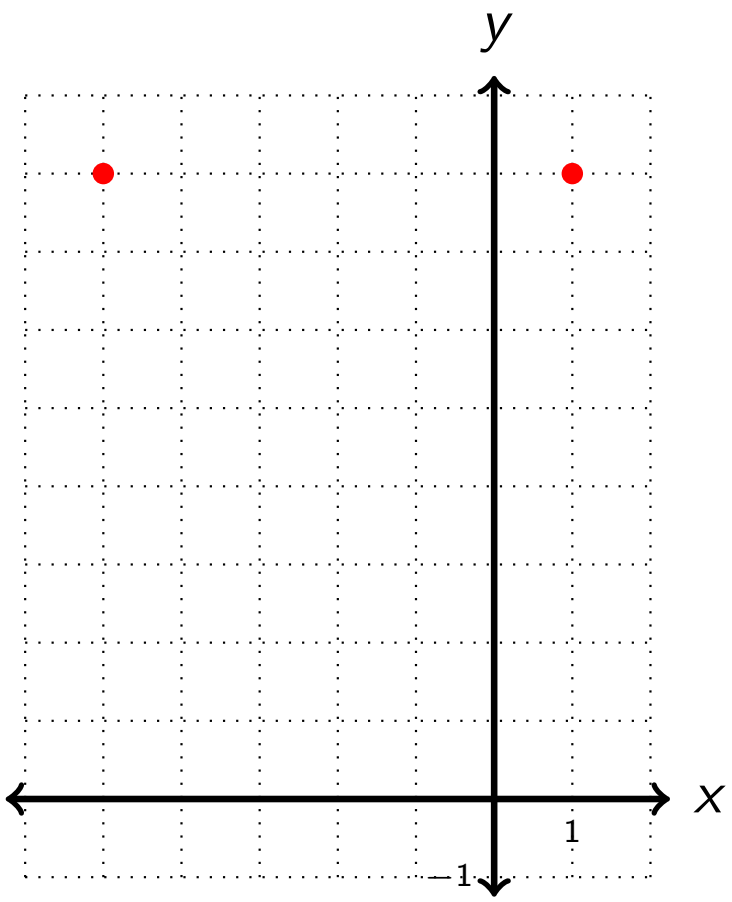

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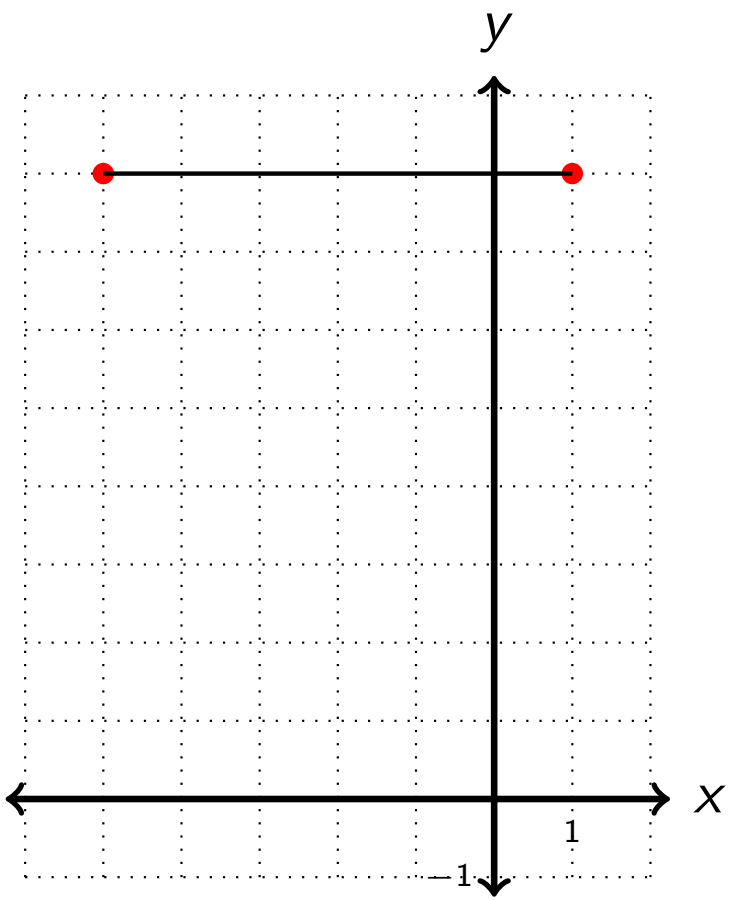

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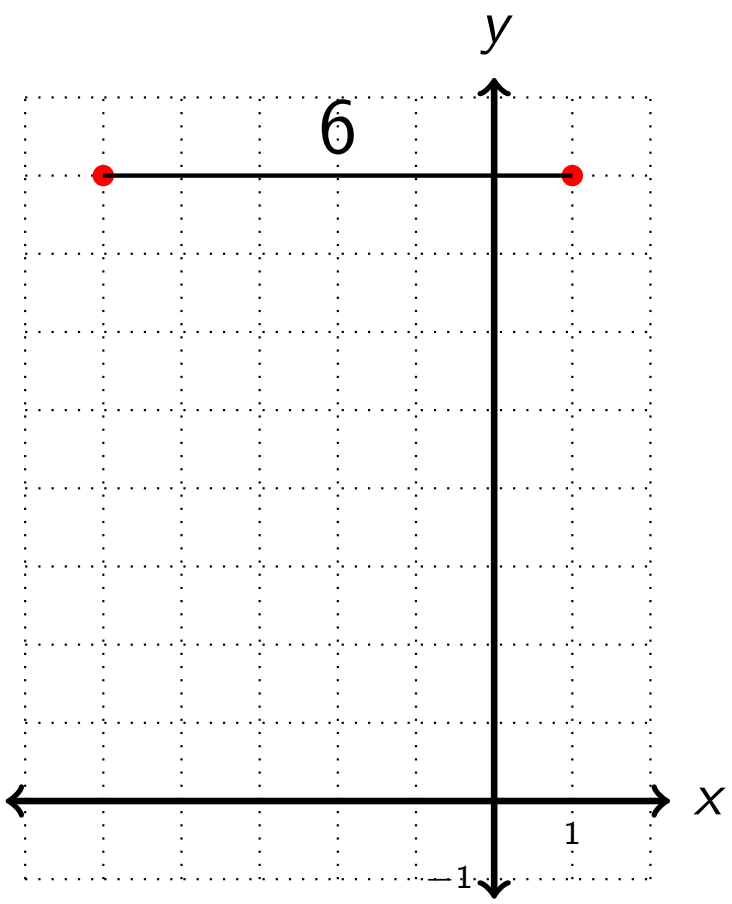


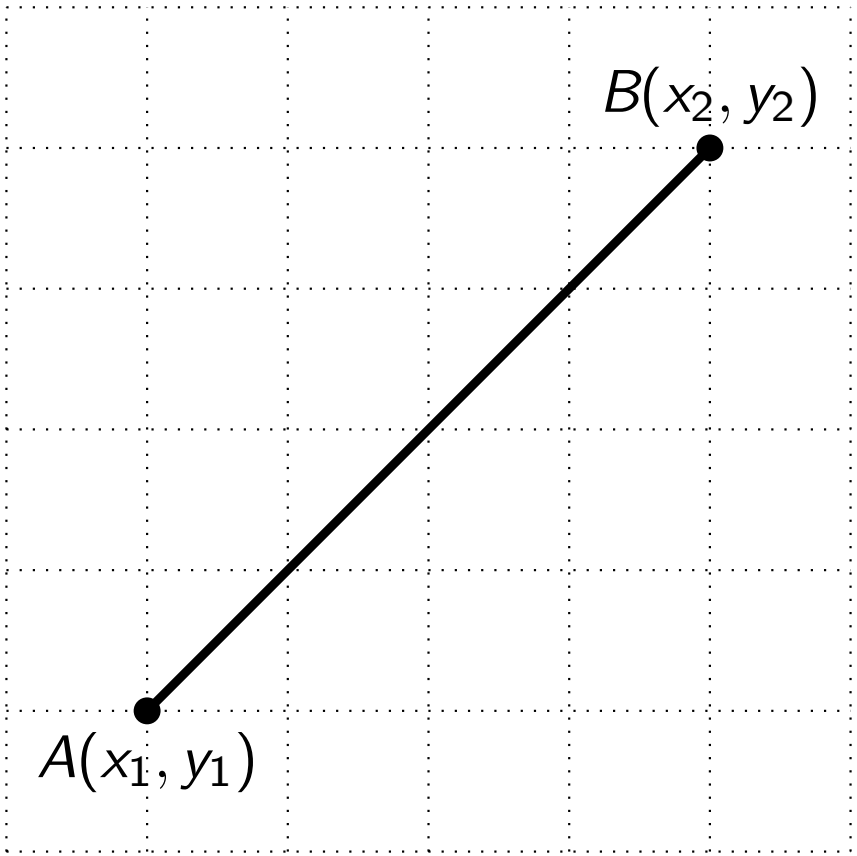
Objectives

1. Find the distance between two points in the coordinate plane

2. Find the midpoint between two points in the coordinate plane

Midpoint

The **midpoint** between 2 points in the coordinate plane is the mean average of the x-coordinates and the mean average of the y-coordinates.



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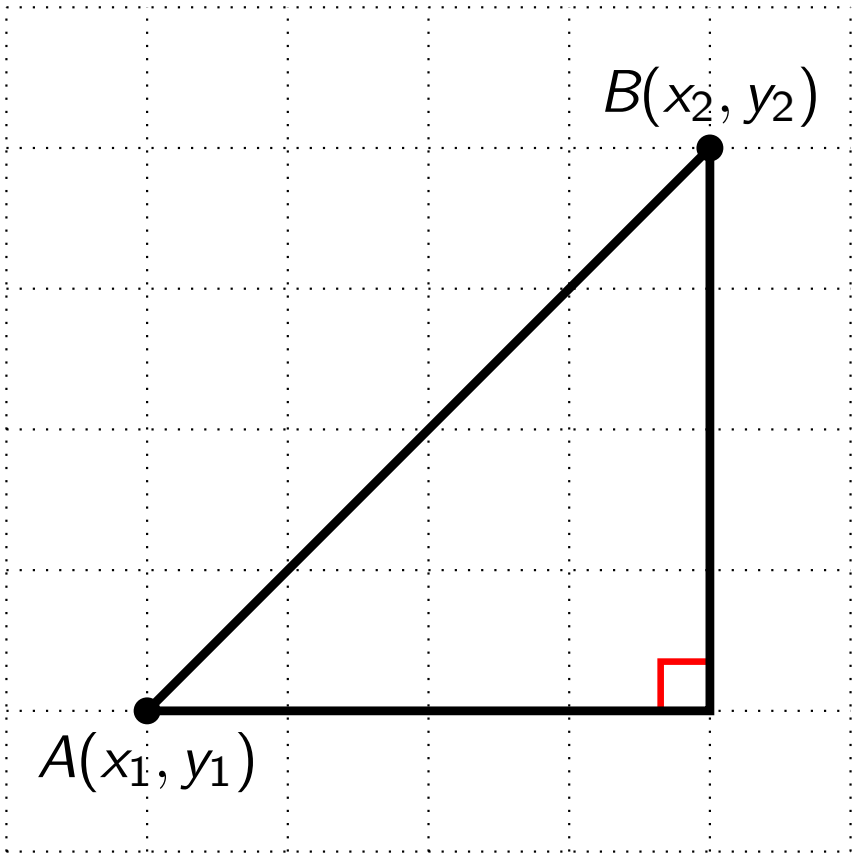

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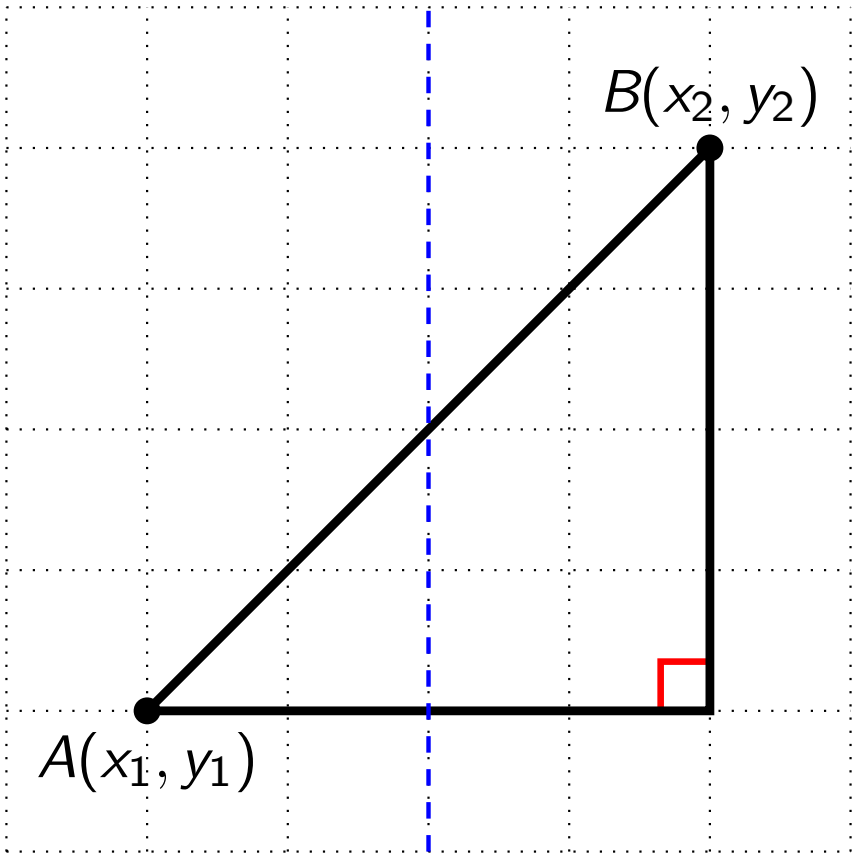

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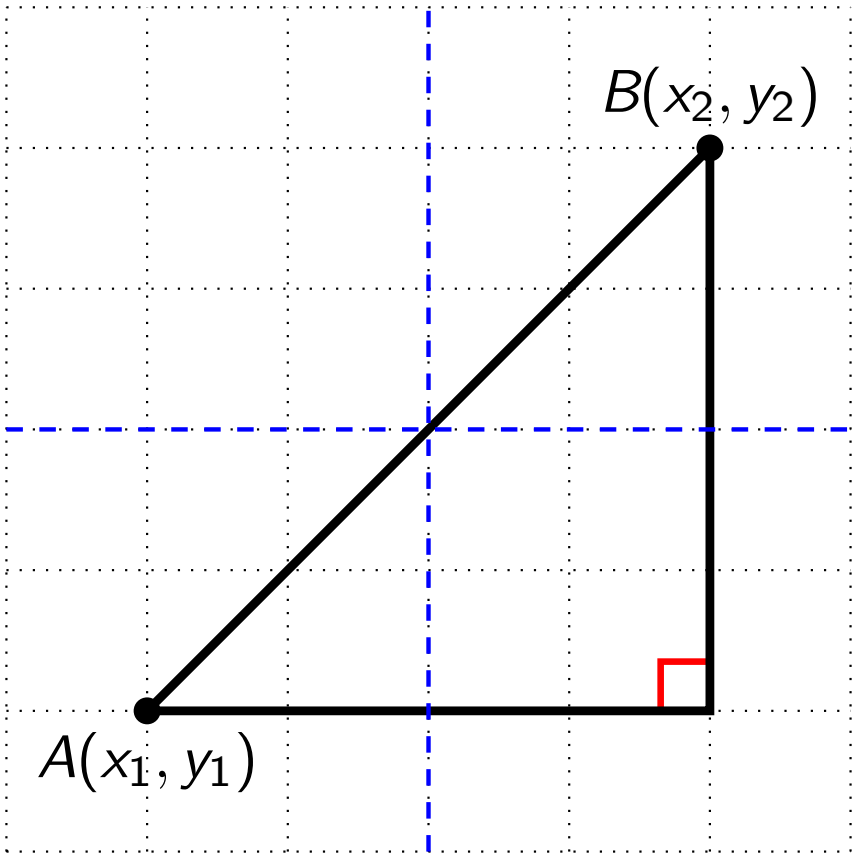

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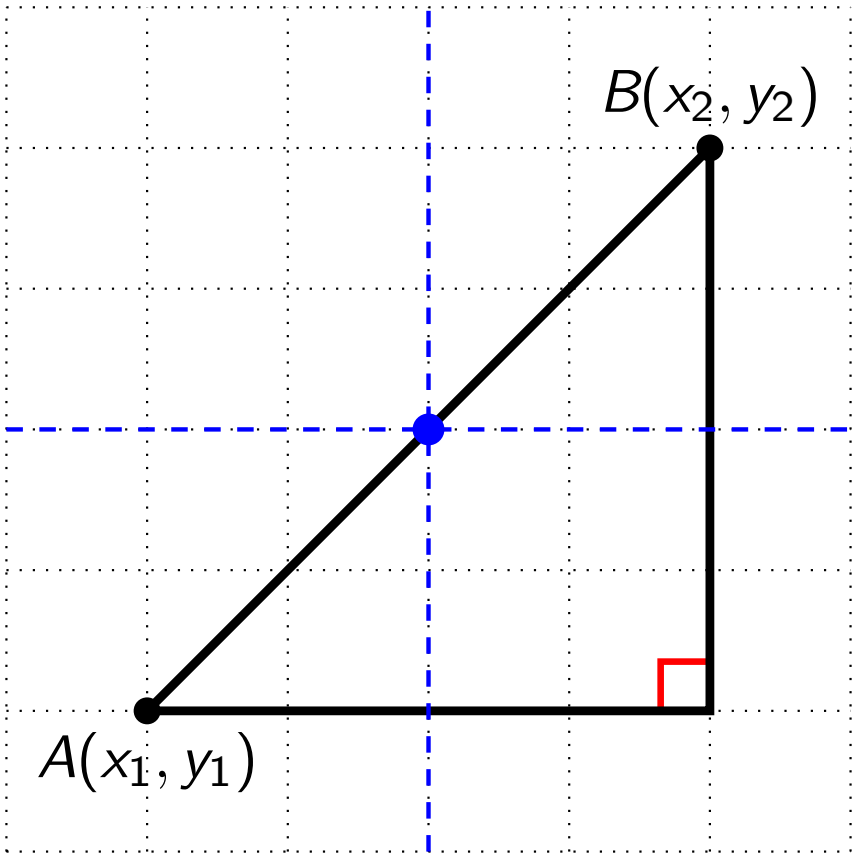

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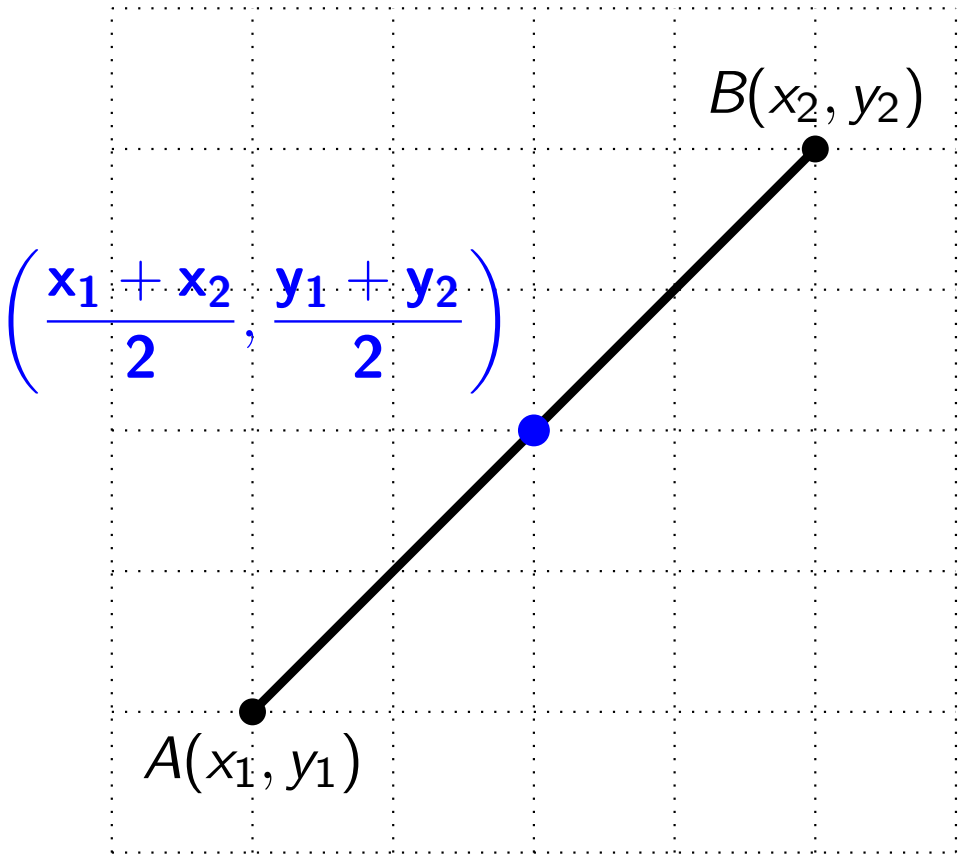

Example 2

Find the midpoint of each pair of points.

(a) $A(4, -7)$ and $B(9, -4)$

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Midpoint: $\left(\frac{13}{2}, -\frac{11}{2}\right)$

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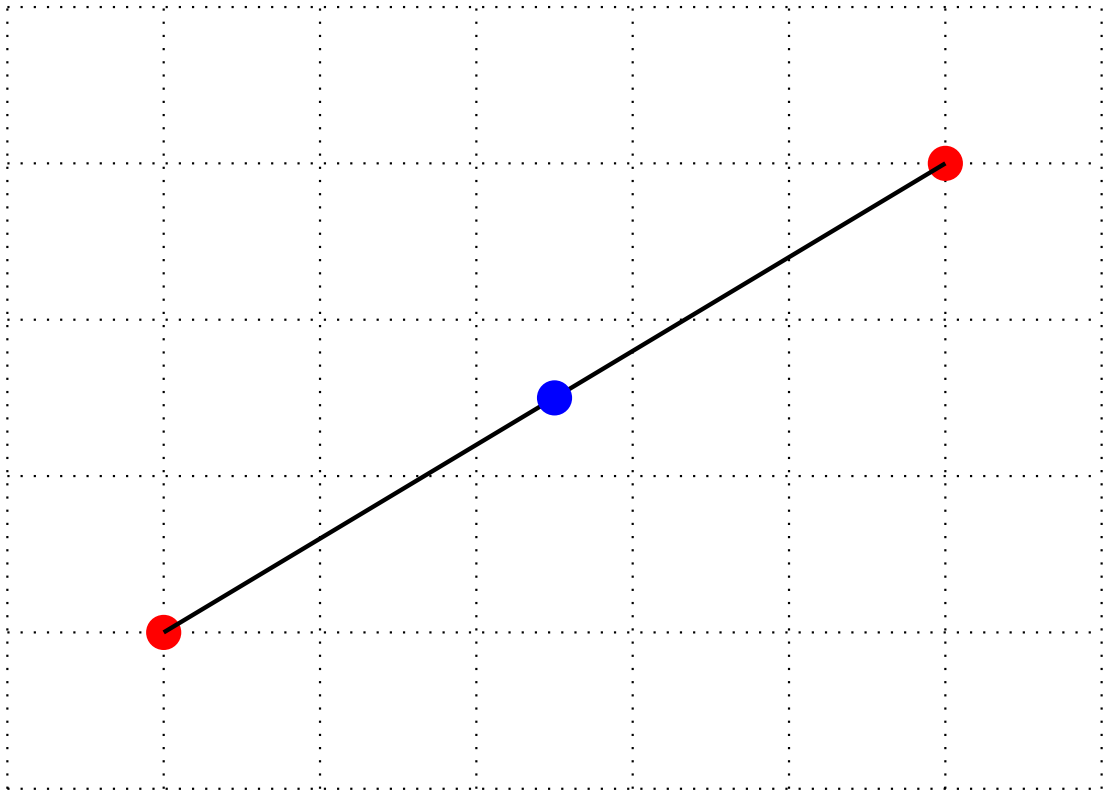

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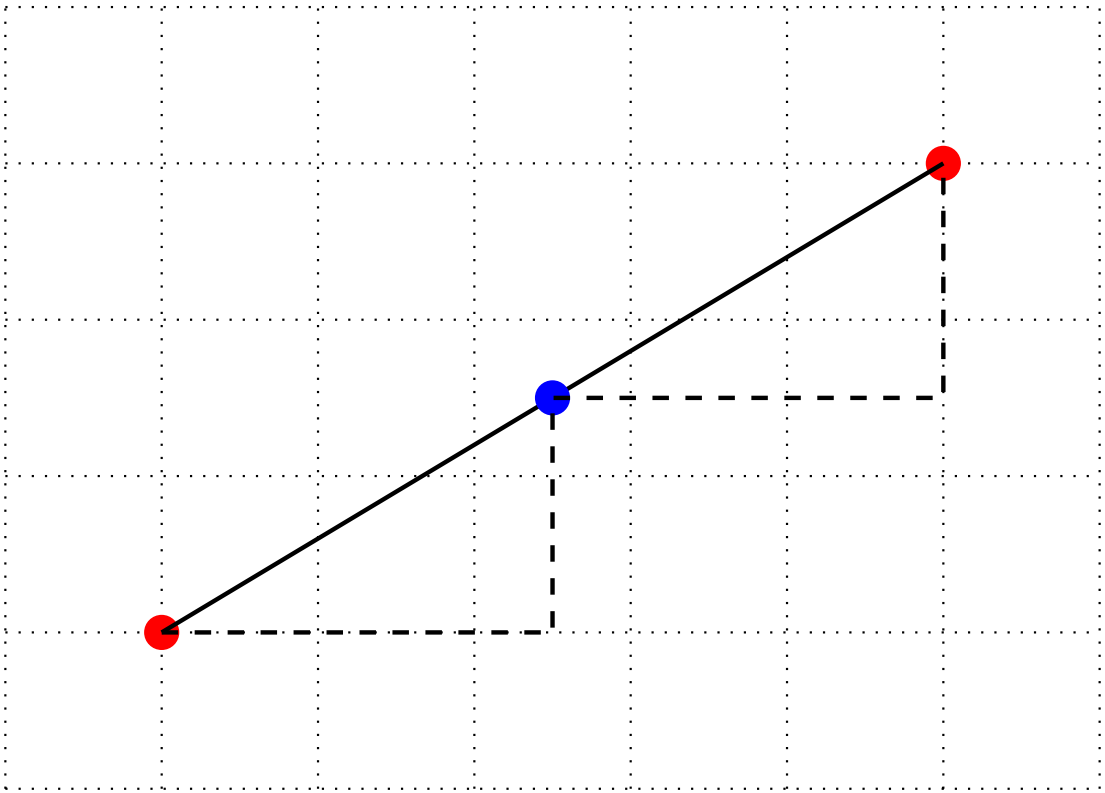

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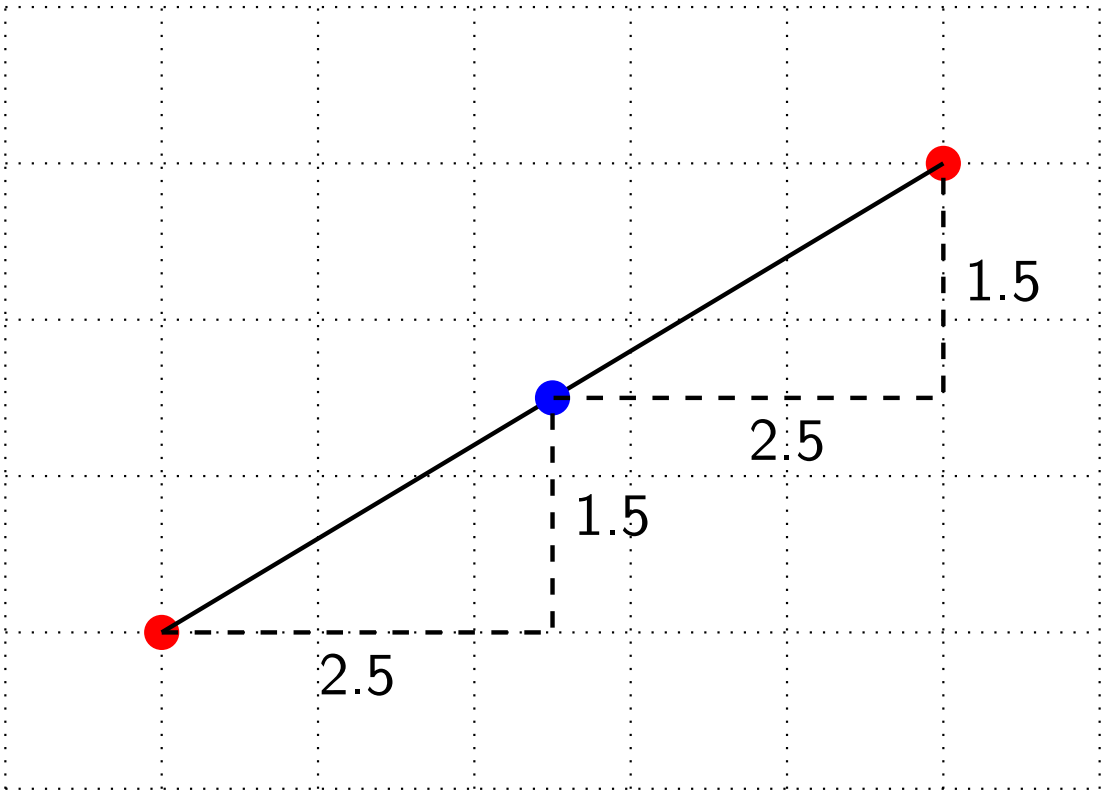

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(b) $(-9, 1)$ and $(-9, 4)$

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Average of y-coordinates:

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Average of x-coordinates:

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Average of y-coordinates:

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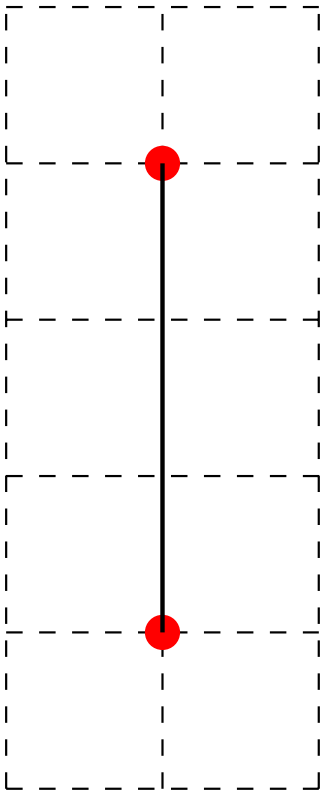
Midpoint: $\left(-9, \frac{5}{2}\right)$

Example 2b



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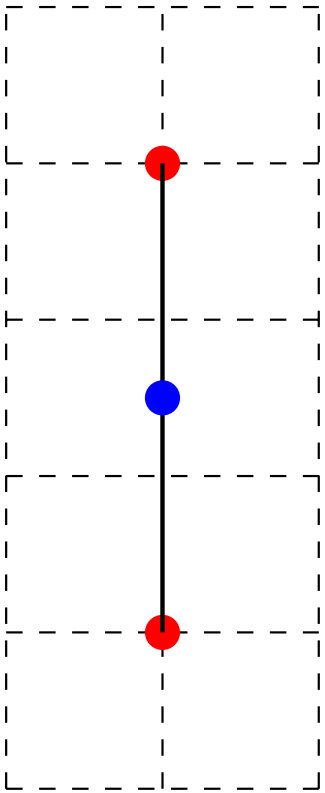

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Find the coordinates of B if M is the midpoint of $\overline{AB}$.

(a) $A(-10, -1)$; $M(-4, 0)$

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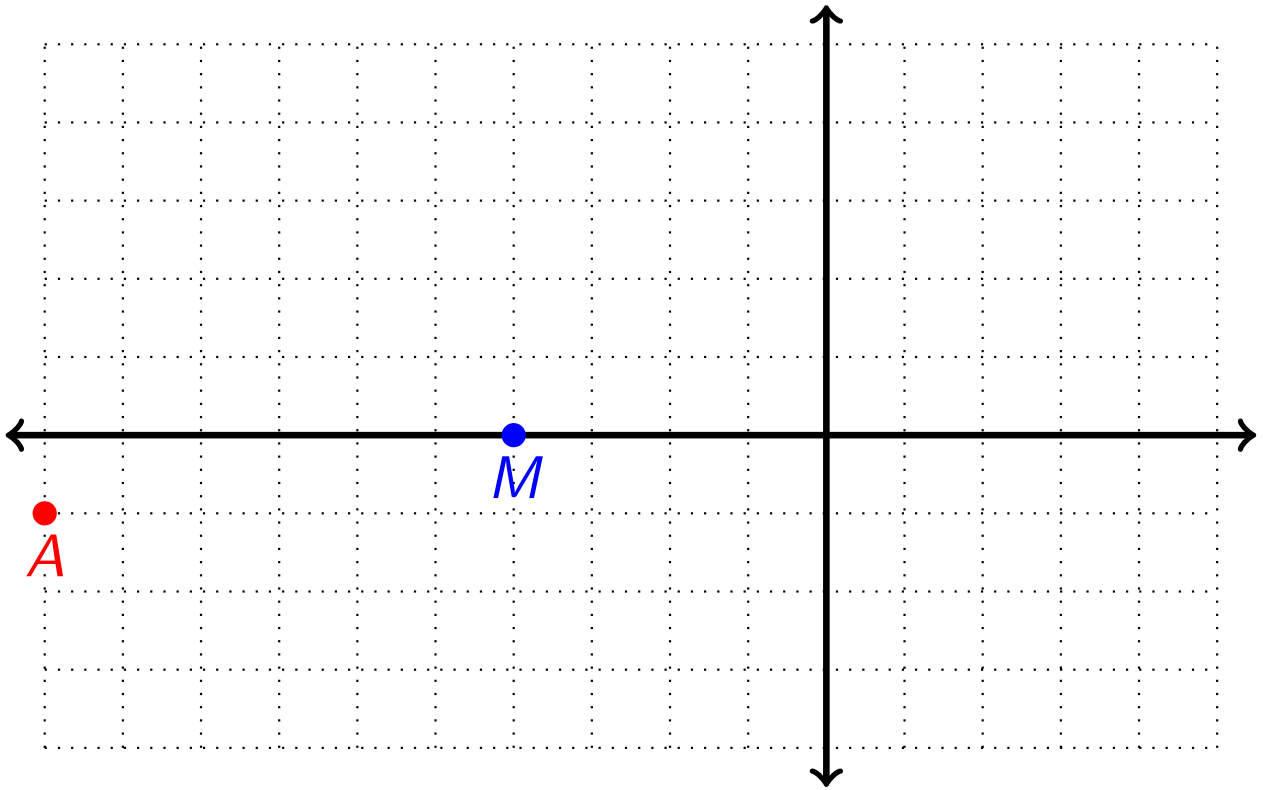

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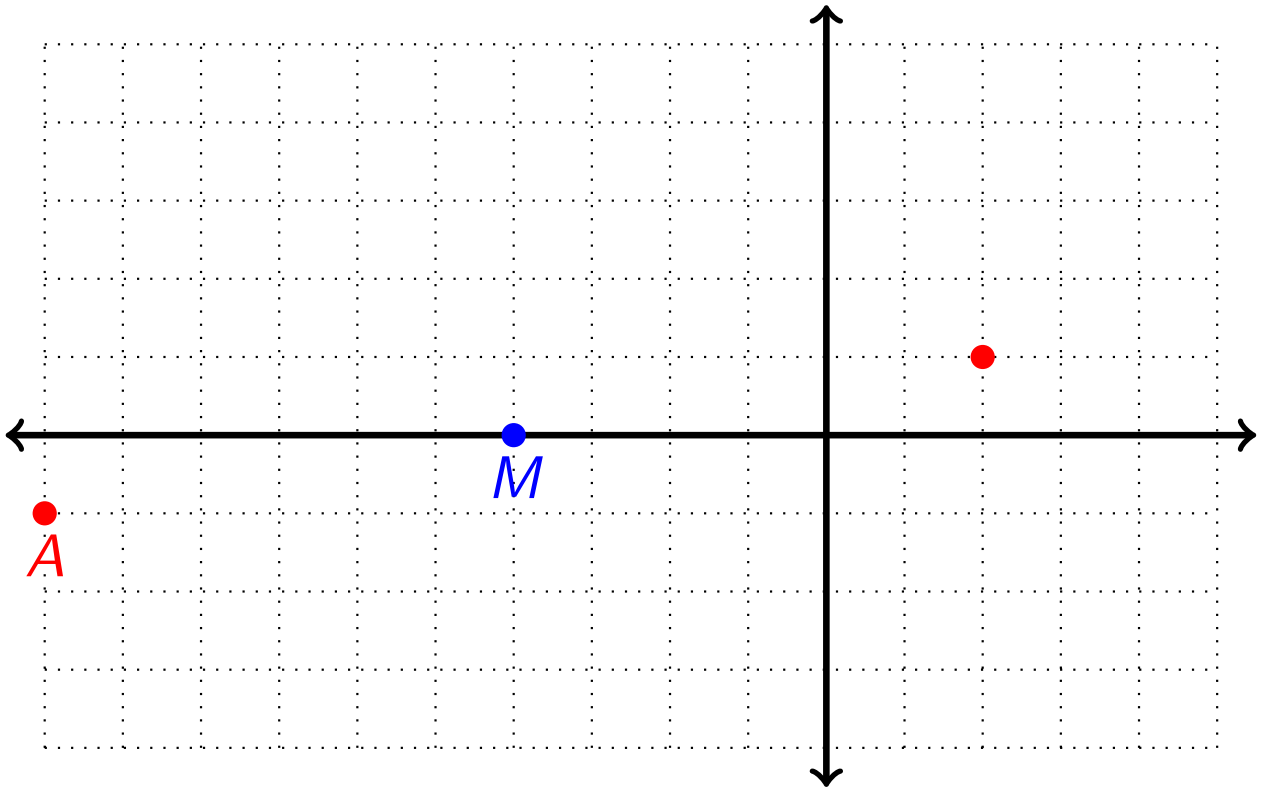

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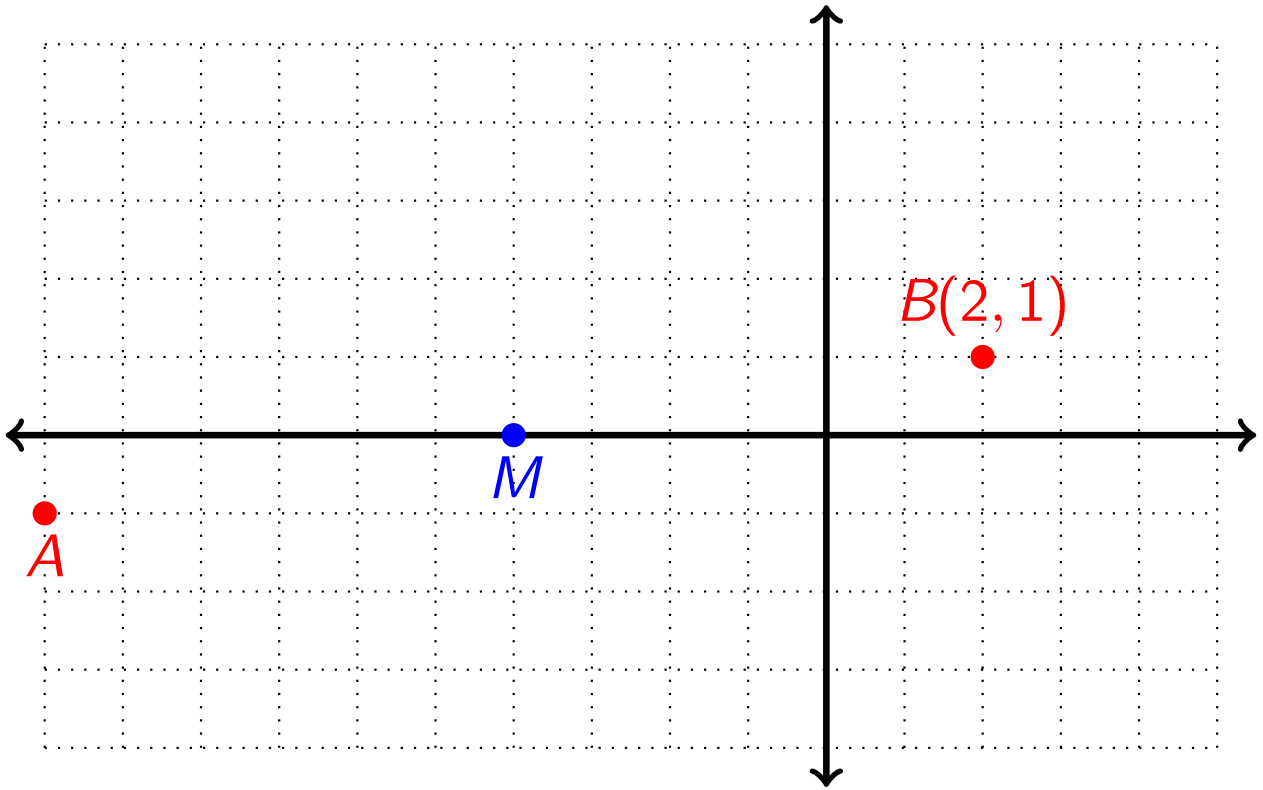

Example 3

(b) $A(6, -4)$; $M(3, 3)$

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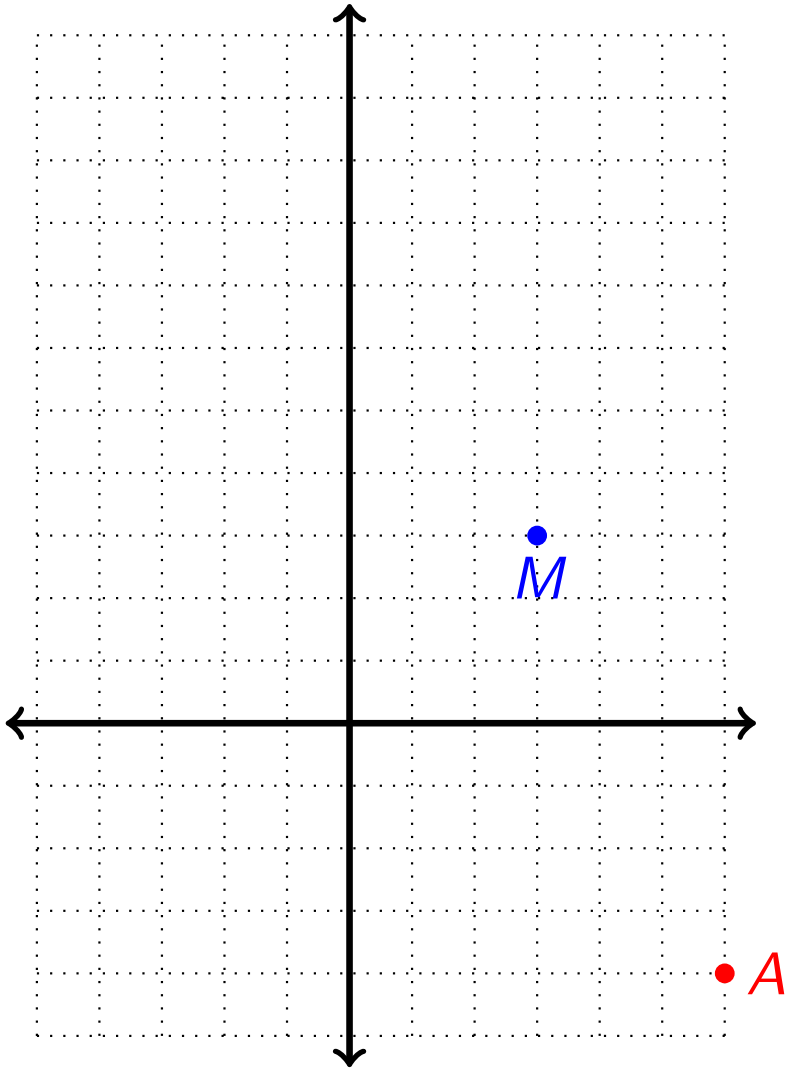

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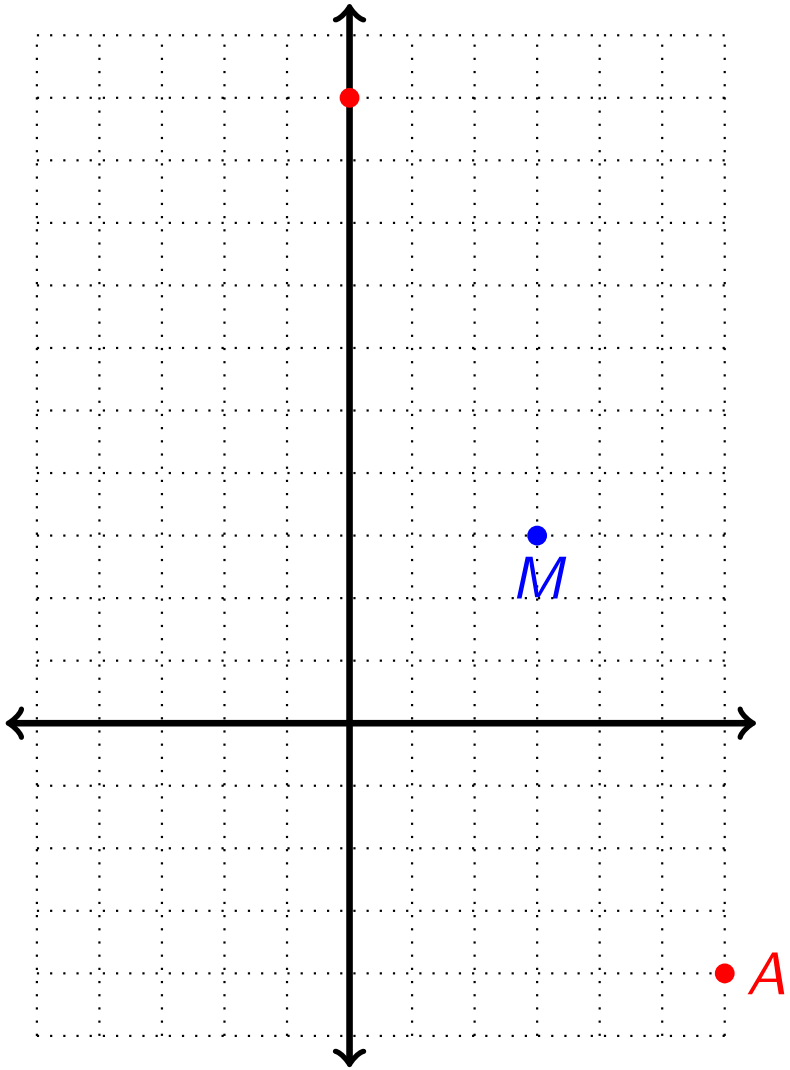

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