

Consider the graph of

$$x^2 + y - 9 = 0$$

and answer the following questions about it. (Either show what equations you use to answer these questions or draw a graph in which the answers can clearly be seen.)

- 1 Is the graph symmetric with respect to the x -axis?

I change y to $-y$, simplify, and compare with the original:

$$\begin{aligned}x^2 + (-y) - 9 &= 0; \\x^2 - y - 9 &= 0.\end{aligned}$$

This is different from the original, so the graph is **not symmetric** with respect to the x -axis.

- 2 Is the graph symmetric with respect to the y -axis?

This time I change x to $-x$:

$$\begin{aligned}(-x)^2 + y - 9 &= 0; \\x^2 + y - 9 &= 0.\end{aligned}$$

This is the same as the original, so the graph is **symmetric** with respect to the y -axis.

- 3 Is the graph symmetric with respect to the origin?

This time I change both:

$$\begin{aligned}(-x)^2 + (-y) - 9 &= 0; \\x^2 - y - 9 &= 0.\end{aligned}$$

This is different from the original, so the graph is **not symmetric** with respect to the origin.

- 4 What are the x -intercepts of this graph?

I change y to 0 and solve for x :

$$\begin{aligned}x^2 + (0) - 9 &= 0; \\x^2 &= 9; \\x &= \pm 3.\end{aligned}$$

Therefore, the x -intercepts are ± 3 , or

$$(3, 0), (-3, 0).$$

- 5 What are the y -intercepts of this graph?

I change x to 0 and solve for y :

$$\begin{aligned}(0)^2 + y - 9 &= 0; \\y &= 9.\end{aligned}$$

Therefore, the only y -intercept is 9, or

$$(0, 9).$$