

Consider the graph of the equation

$$y = x^2 - 3x - 4$$

and answer the following questions about it. For each part, either show what equations you use to answer it or draw a graph in which the answer 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:

$$\begin{aligned}(-y) &= x^2 - 3x - 4; \\ -y &= x^2 - 3x - 4; \\ y &= -x^2 + 3x + 4.\end{aligned}$$

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 origin?

This time I change both x to $-x$ and y to $-y$:

$$\begin{aligned}(-y) &= (-x)^2 - 3(-x) - 4; \\ -y &= x^2 + 3x - 4; \\ y &= -x^2 - 3x + 4.\end{aligned}$$

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

- 3** What are the y -intercepts of this graph, if any?

I change x to 0 and solve for y :

$$\begin{aligned}y &= (0)^2 - 3(0) - 4; \\ y &= -4.\end{aligned}$$

Therefore, the only y -intercept is

$$(0, -4).$$