



Tests for Symmetry

There are three types of symmetry: with respect to the x-axis, with respect to the y-axis and to the origin

X-axis

If (x,y) is any point on the graph and $(x,-y)$ is also on the graph, then the graph is symmetric to the x-axis

Y-axis

If (x,y) is any point on the graph and $(-x,y)$ is also on the graph, then it is symmetric to the y-axis.

Origin

If (x,y) is any point on the graph and $(-x,-y)$ is also on the graph, then it is symmetric to the origin

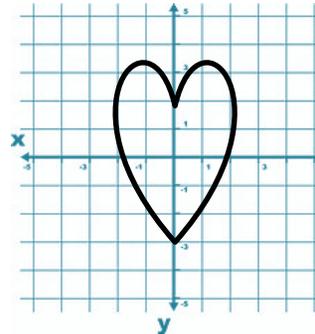
Example using the equation:

$$y = x^2 + 4$$

- x-axis test $(x,-y)$:
 $(-y) = x^2 + 4, \rightarrow$
 $y = -x^2 - 4$
 Not the same as original so **no!**
- y-axis test $(-x,y)$:
 $y = (-x)^2 + 4, \rightarrow$
 $y = x^2 + 4$
 Same as the original so **yes!**
- Origin $(-x,-y)$:
 $(-y) = (-x)^2 + 4, \rightarrow$
 $(-y) = x^2 + 4, \text{ or } y = -x^2 - 4$
 Not the same as the original so **no!**



Symmetry Examples Using the Graph & Test Point



Test points:

x-axis $(x,-y)$:

$(2,1) \rightarrow (2,-1)$

Not on graph!

y-axis $(-x,y)$:

$(2,1) \rightarrow (-2,1)$

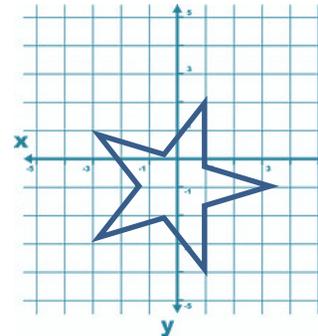
$(1,4) \rightarrow (-1,4)$

So **yes!**

Origin $(-x,-y)$:

$(2,1) \rightarrow (-2,-1)$

Not on graph!



Test points:

x-axis $(x,-y)$:

$(1,3) \rightarrow (1,-3)$

Yes!

y-axis $(-x,y)$:

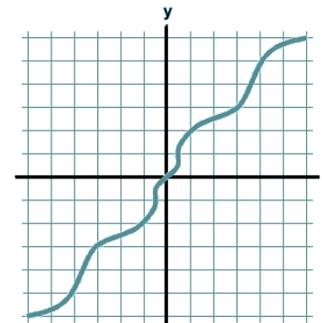
$(1,3) \rightarrow (-1,3)$

Not on graph!

Origin $(-x,-y)$:

$(1,3) \rightarrow (-1,-3)$

Not on graph!



Test points:

x-axis $(x,-y)$:

$(3,3) \rightarrow (3,-3)$

Not on graph!

y-axis $(-x,y)$:

$(3,3) \rightarrow (-3,3)$

Not on graph!

Origin $(-x,-y)$:

$(3,3) \rightarrow (-3,-3)$

Yes!