Rules for Symmetry

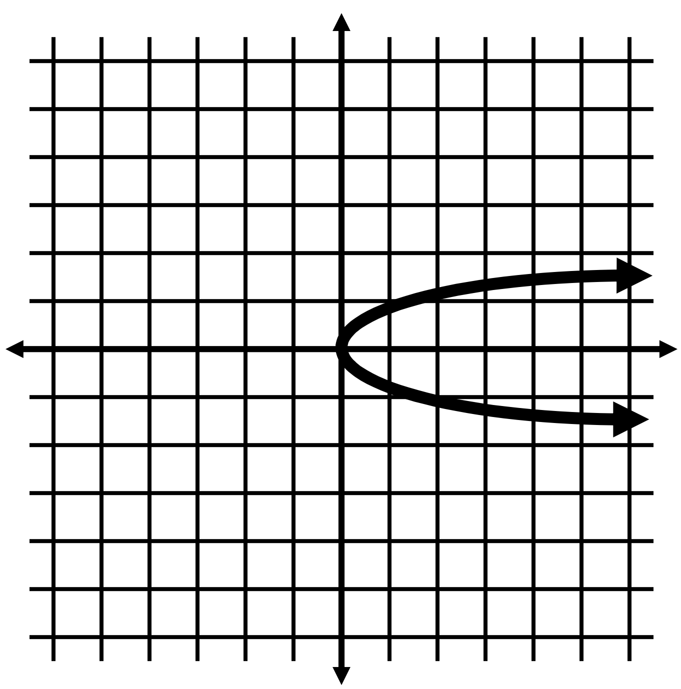
I. **Symmetric about the x-axis-**

This means that the x-axis serves as a mirror reflecting the same image on either side of it. To determine this type of symmetry, replace y with a negative y and attempt to make the equation back to its original form. If it is symmetric about the x-axis, then you shall end up with the same exact problem that you started with at the beginning.

Ex: $y^2 = x$

1. $(-y)^2 = x$
2. $y^2 = x$ square the y.

This is the problem we began with; therefore, the function is symmetric about the x- axis.



II. Symmetric about the y-axis:

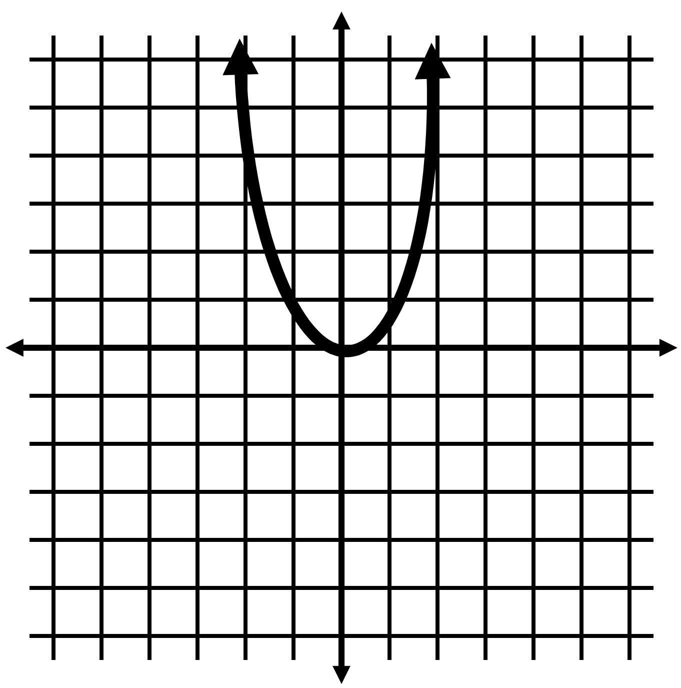
By the same token as above, the symmetry is due to the y axis acting as that mirror. So, you guessed it the y-axis serves as a mirror to the function. To determine this type of symmetry, replace x with negative x , and if you get the same term that you started out with, then it is symmetric about the y-axis.

Ex: $\mathbf{y = x^2}$

1. $y = (-x)^2$

2. $y = x^2$

Therefore, the function is symmetric about the y-axis;



II. Symmetric about the origin:

This is the last chance for symmetry. A clue that is symmetric about the origin is that the symmetry of x and y answers equal each other. Typically, when testing for symmetry, x and y axis are tested first then the origin. The result's of x and y axis symmetry should equal each other if it is going to be symmetric about the origin. You can still use the method of plugging in, this time both a –x & -y, to see if you can simplify it to what you started out.

Ex: $y = \dfrac{x}{x^2+1}$ 1. y-axis $y = \dfrac{(-x)}{(-x)^2+1}$

Simplifying, $y = \dfrac{-x}{x^2+1}$

Since, this is not the same as the original, it is not symmetric to the y-axis.

2. x-axis $(-y) = \dfrac{x}{x^2+1}$

Solving for $y = \dfrac{-x}{x^2+1}$

Since, this is not the same as the original, it is not symmetric to the x-axis.

***Note- the answers to steps 1 and 2 are equal this is your clue as to symmetry about the origin.**

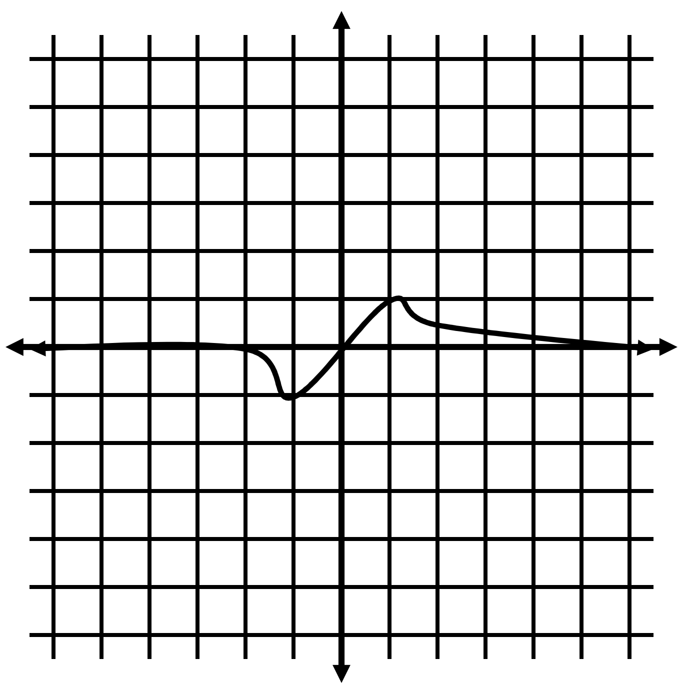
3. Origin symmetry:

$$(-y) = \frac{(-x)}{(-x)^2 + 1}$$

Simplify, and solve for y:

$$-y = \frac{-x}{x^2 + 1} \quad \rightarrow \quad y = \frac{x}{x^2 + 1}$$

This is the same as the starting problem, so it is symmetric about the origin.



If all of these tests fail, then there is no symmetry.