Exercise 39

In Exercises 29–40, test for symmetry with respect to each axis and to the origin.

$$y = |x^3 + x|$$

Solution

Replacing x with $-x$ does not change the equation, so there is symmetry with respect to the y-axis.

$$y = |(-x)^3 + (-x)| = |-x^3 - x| = |x^3 + x|$$

Replacing y with $-y$ changes the equation, so there's no symmetry with respect to the x-axis.

$$-y = |x^3 + x| \quad \rightarrow \quad y = -|x^3 + x|$$

Replacing x with $-x$ and y with $-y$ changes the equation, so there's no symmetry with respect to the origin.

$$-y = |(-x)^3 + (-x)| = |-x^3 - x| = |x^3 + x| \quad \rightarrow \quad y = -|x^3 + x|$$