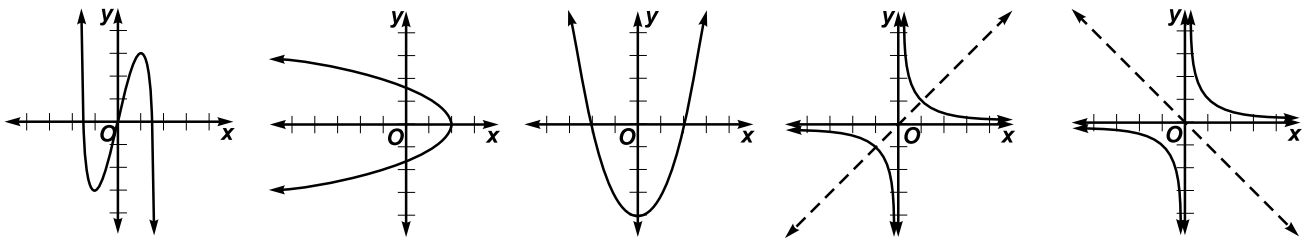
NAME _____ DATE _____ PERIOD _____

Study Guide

Symmetry and Coordinate Graphs

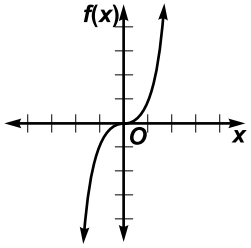
One type of symmetry a graph may have is **point symmetry.** A common point of symmetry is the origin. Another type of symmetry is **line symmetry.** Some common lines of symmetry are the x-axis, the y-axis, and the lines $y = x$ and $y = -x$.

point **x-axis** **y-axis** **$y = x$** **$y = -x$**



Example 1 **Determine whether $f(x) = x^3$ is symmetric with respect to the origin.**

If $f(-x) = -f(x)$, the graph has point symmetry.



Find $f(-x)$.	Find $-f(x)$.
$f(-x) = (-x)^3$	$-f(x) = -x^3$
$f(-x) = -x^3$	

The graph of $f(x) = x^3$ is symmetric with respect to the origin because $f(-x) = -f(x)$.

Example 2 **Determine whether the graph of $x^2 + 2 = y^2$ is symmetric with respect to the x-axis, the y-axis, the line $y = x$, the line $y = -x$, or none of these.**

Substituting (a, b) into the equation yields $a^2 + 2 = b^2$. Check to see if each test produces an equation equivalent to $a^2 + 2 = b^2$.

x-axis	$a^2 + 2 = (-b)^2$	*Substitute $(a, -b)$ into the equation.*
	$a^2 + 2 = b^2$	*Equivalent to $a^2 + 2 = b^2$*
y-axis	$(-a)^2 + 2 = b^2$	*Substitute $(-a, b)$ into the equation.*
	$a^2 + 2 = b^2$	*Equivalent to $a^2 + 2 = b^2$*
$y = x$	$(b)^2 + 2 = (a)^2$	*Substitute (b, a) into the equation.*
	$a^2 - 2 = b^2$	*Not equivalent to $a^2 + 2 = b^2$*
$y = -x$	$(-b)^2 + 2 = (-a)^2$	*Substitute $(-b, -a)$ into the equation.*
	$b^2 + 2 = a^2$	*Simplify.*
	$a^2 - 2 = b^2$	*Not equivalent to $a^2 + 2 = b^2$*

Therefore, the graph of $x^2 + 2 = y^2$ is symmetric with respect to the x-axis and the y-axis.