2-6 Families of Functions

Essential Understanding There are sets of functions, called *families*, in which each function is a transformation of a special function called the *parent*.

The linear functions form a family of functions. Each linear function is a transformation of the function $y = x$. The function $y = x$ is the *parent* linear function.

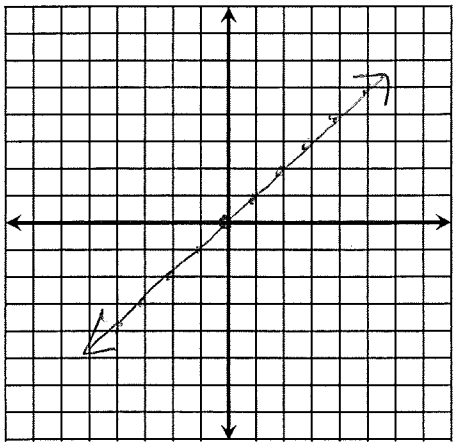
A **parent function** is the simplest form in a set of functions that form a family. Each function in the family is a **transformation** of the parent function.

One type of transformation is a **translation**. A translation shifts the graph of the parent function horizontally, vertically, or both without changing shape or orientation. For a positive constant k and a parent function $f(x)$, $f(x) \pm k$ is a vertical translation. For a positive constant h, $f(x \pm h)$ is a horizontal translation.

$y = x$ linear function

Example: Graph $f(x) = x$

x	y
-3	-3
-2	-2
-1	-1
0	0
1	1
2	2
3	3

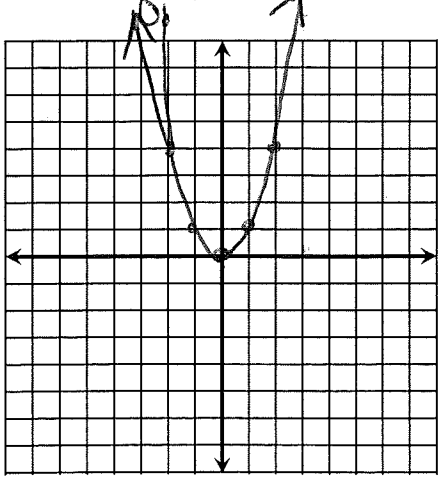


$y = x+2$
$y = x-3$

$y = x^2$ quadratic

Example: Graph $f(x) = x^2$

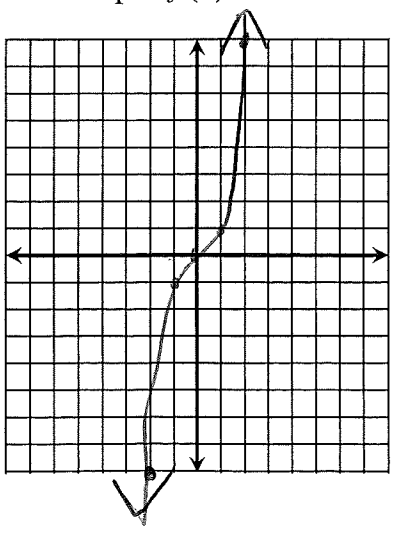
x	y
-3	9
-2	4
-1	1
→ 0	0 ←
1	1
2	4
3	9



$y = x^3$

Example: Graph $f(x) = x^3$

x	y
-3	-27
-2	-8
-1	-1
0	0
1	1
2	8
3	27

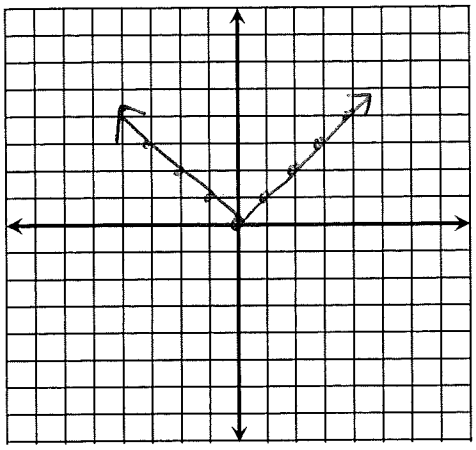


absolute value function

Example: Graph $f(x) = |x|$

$Y = |x|$

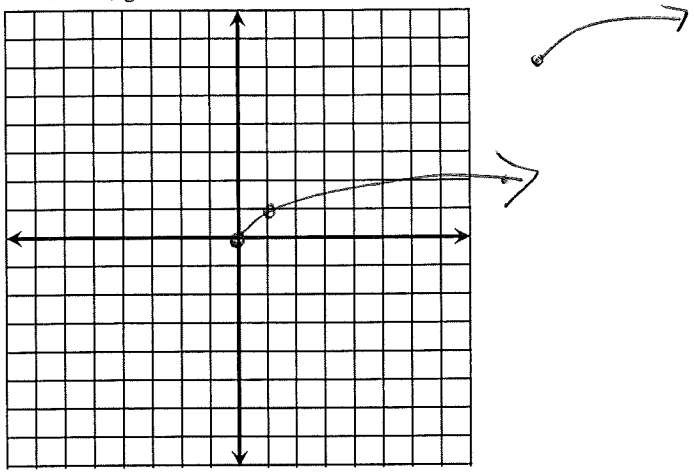
x	y
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3



square root function

Example: Graph $f(x) = \sqrt{x}$

x	y
X	X
0	0
1	1
2	1.41...
4	2
9	3

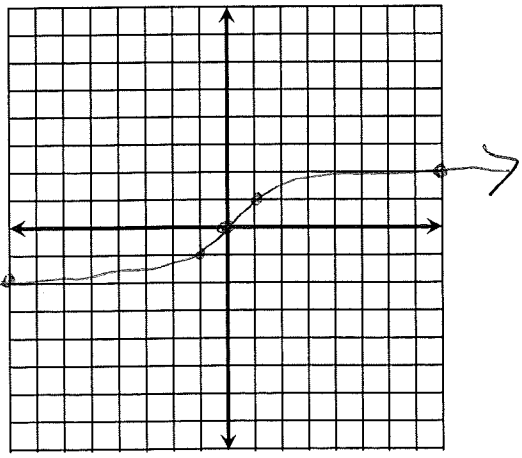


cube root

$y = \sqrt[3]{x}$

Example: Graph $\sqrt[3]{x} = y$

x	y
2	3
8	2
1	1
0	0
-1	-1
-8	-2
-27	-3



reciprocal function

$y = \frac{1}{x}$

Example: Graph $\frac{1}{x} = y$

X	y
1	
0	X
-1