Write About it Wednesday

1. Describe, in words, the changes on the parent function *f*(x) = x given the following equations:

a. *f*(x) = (x - 15)

b. *f*(x) = x + 21

c. *f*(x) = 1/3x

d. *f*(x) = 9x

2. What is the effect on the graph of *f*(x) = x when it has been transformed into *f*(x) = -x? Use a calculator if necessary.

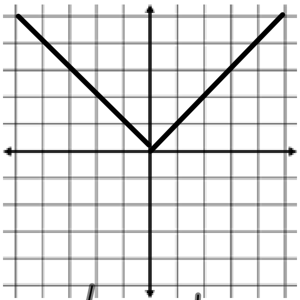
Parent Function

Absolute Value

Equation:

$f(x) = y = |x|$

Graph



$y = |x|$

$y = x$

$y = -x$

x	y
-1	1
1	1

$d: \mathbb{R}$

$r: \{y \mid y \geq 0\}$

To transform it...

$y = a|x \pm h| \pm k$

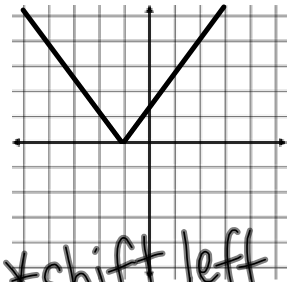
width

horizontal

vertical

Moved left

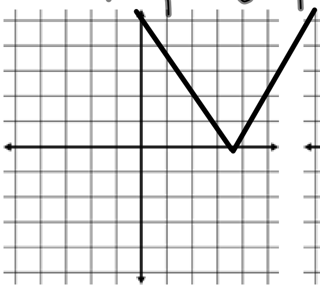
$y = |x+1|$



*shift left 1 unit

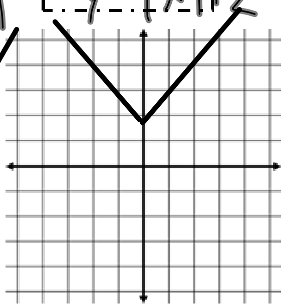
Moved right

$y = |x-3\frac{1}{2}|$



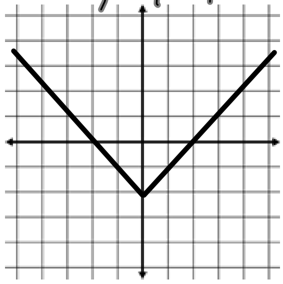
Moved up

$y = |x|+2$



Moved down

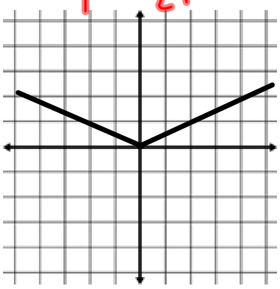
$y = |x|-2$



$0 <$ Dilation factor < 1

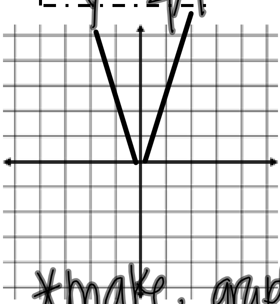
$y = \frac{1}{2}|x|$

makes graph wider



Dilation factor > 1

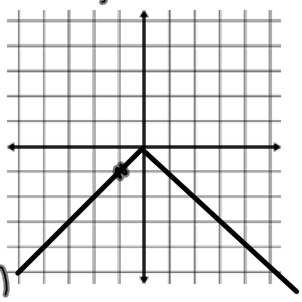
$y = 2|x|$



*make graph narrow

Reflection across x-axis

$y = |x|$



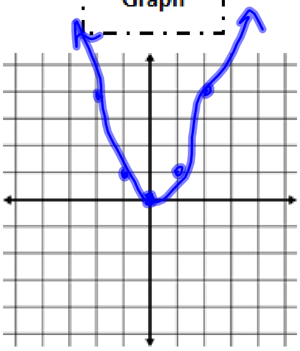
x	y
1	-1

$y=1\cdot(x+0)^2+0$

Parent Function Quadratic

Equation: $y = x^2$

Graph



x	y
1	1
2	4
3	9
-2	4
-1	1

d: $\{x \mid x\ \mathbb{R}\}$, $\{\mathbb{R}\}$

r $\{y \mid y \geq 0\}$

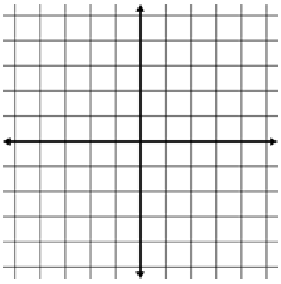
To transform it...

$y = a(x \pm h)^2 \pm k$

width L/R U/D

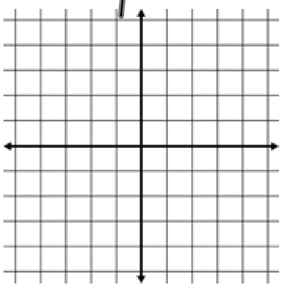
Moved left

$y = (x+1)^2$



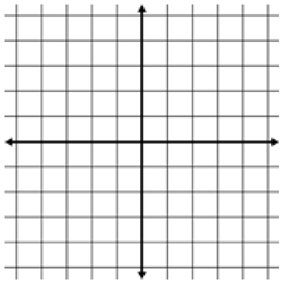
Moved right

$y = (x-1)^2$



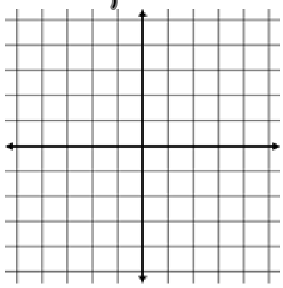
Moved up

$y = x^2+1$



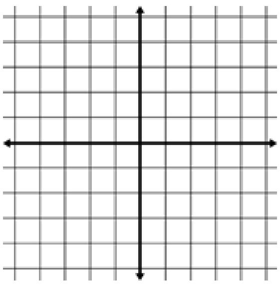
Moved down

$y = x^2-1$



makes wider ← $0 <$ **Dilation factor < 1**

=



narrow ← **Dilation factor > 1**

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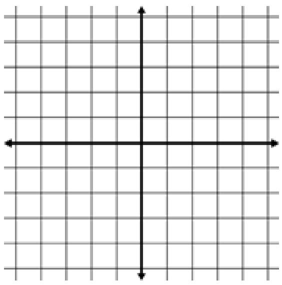
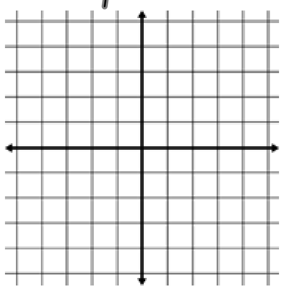


Reflection across x-axis

$y = -x^2$



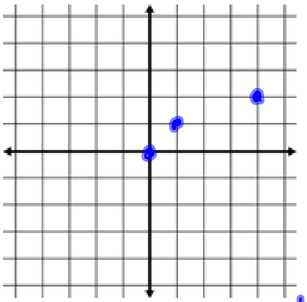
Parent Function

Square Root

Equation:

$y = \sqrt{x}$

Graph



$d: \{x \mid x \geq 0\}$

$r: \{y \mid y \geq 0\}$

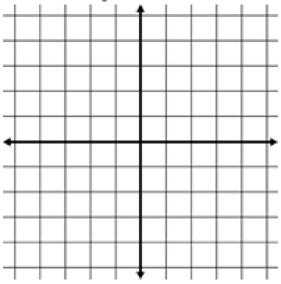
x	y
0	0
1	1
4	2

To transform it...

$y = a\sqrt{x \pm h} \pm k$

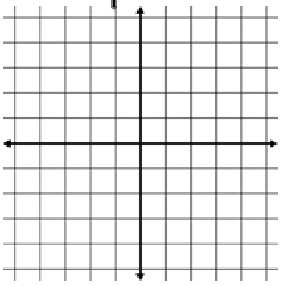
Moved left

$y = \sqrt{x+1}$



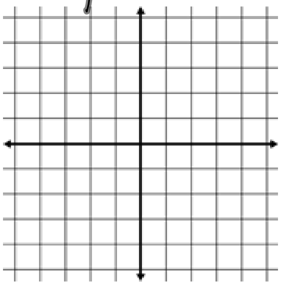
Moved right

$y = \sqrt{x-1}$



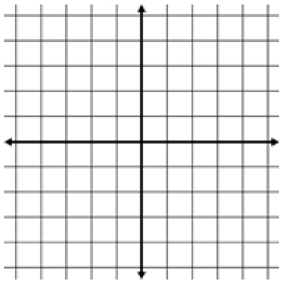
Moved up

$y = \sqrt{x} + 3$



Moved down

$y = \sqrt{x} - 3$



$0 <$ **Dilation factor < 1**

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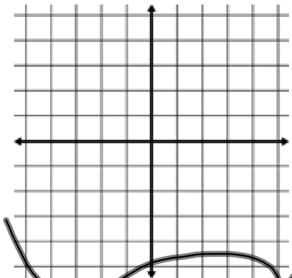
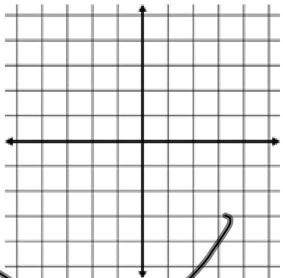


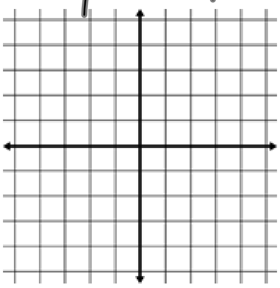
Dilation factor > 1

=



Reflection across x-axis

$y = -\sqrt{x}$



curve

Shifting Up & Down: $f(x) \pm k$

- _______________ a positive number to the parent function shifts it _______________ that many spaces.
  - Example: y = |x| + 4 is a shift of the absolute value graph _______________
- _______________ a positive number from the parent function shifts it _______________ that many spaces.
  - Example: $y = x^2 - 3$ is a shift of the quadratic function _______________.

Shifting Left & Right: $f(x \mp h)$

- _______________ a positive number before evaluating the function results in a shift _______________.
  - Example: y = |x + 4| is a shift of the absolute value graph _______________.
- _______________ a positive number before evaluating the function results in a shift _______________.
  - Example: $y = (x - 3)^2$ is a shift of the quadratic function _______________.

Reflection over the x-axis: $-f(x)$

- Making the function ______________ causes the function to ______________ over the ______________.

Example: y = -|x| is the absolute value graph that ______________ ______________.

Example: $y = -x^2$ a parabola that ______________ ______________.

Dilation: Vertical Stretch/Compression: $a \cdot f(x)$

- If the function is multiplied by a value |a| > 1, then the graph will grow ______________ and it is called a vertical ______________.
- If the function is multiplied by a value |a| < 1, then the graph will grow more ______________ and it is called a vertical ______________.