

2.5 and 2.6 Absolute Value Functions

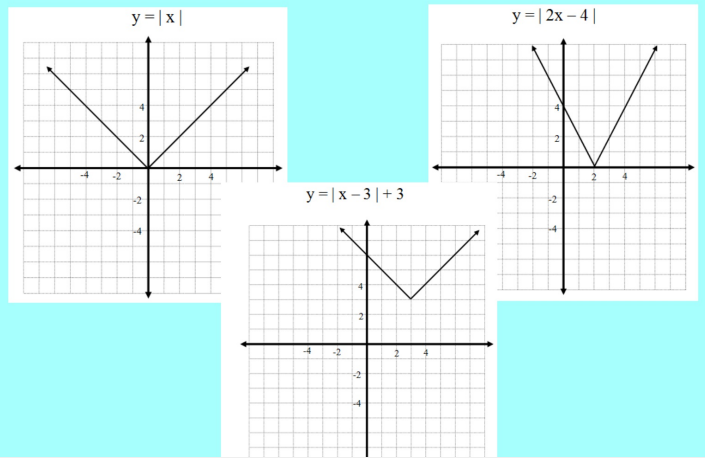
Absolute Value Function $f(x) = |mx + b| + c$ where $m \neq 0$.

The graphs of absolute value equations look like Vs.

The vertex of a function is a point where the function reaches a maximum or a minimum.

The vertex of $y = |mx + b| + c$ is located at $\left(\frac{-b}{m}, c\right)$

$$\begin{aligned} mx + b &= 0 \\ mx &= -b \\ x &= \frac{-b}{m} \end{aligned}$$



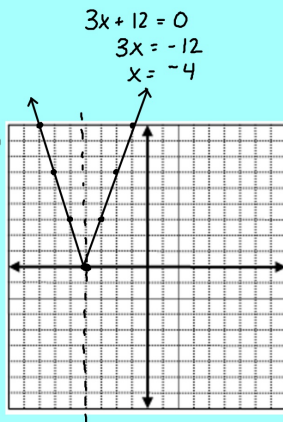
For each graph, do the following.

1. Find the vertex $(-4, 0)$
2. Find the axis of symmetry $x = -4$
3. Use the slope and graph
4. Does it stretch or compress?
5. State the domain and range $d: (-\infty, \infty)$
 $r: [0, \infty)$
6. Describe the end behavior

$y = |3x + 12|$ (\uparrow, \uparrow)

$as\ x \rightarrow -\infty, f(x) \rightarrow \infty$

$as\ x \rightarrow \infty, f(x) \rightarrow \infty$



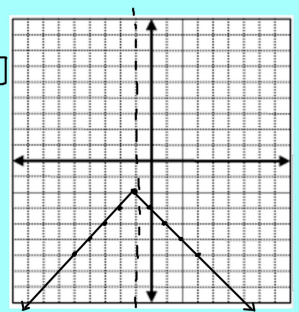
For each graph, do the following.

1. Find the vertex $(-1, -2)$
2. Find the axis of symmetry $x = -1$
3. Use the slope and graph
4. Does it stretch or compress? **neither**
5. State the domain and range $d: (-\infty, \infty)$
 $r: (-\infty, -2]$
6. Describe the end behavior

$y = -|x + 1| - 2$

$as\ x \rightarrow -\infty, f(x) \rightarrow -\infty$

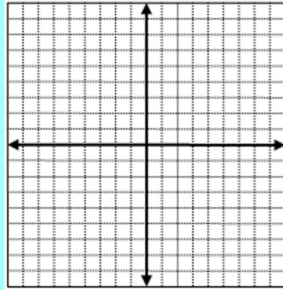
$as\ x \rightarrow \infty, f(x) \rightarrow -\infty$



For each graph, do the following.

1. Find the vertex
2. Find the axis of symmetry
3. Use the slope and graph
4. Does it stretch or compress?
5. State the domain and range
6. Describe the end behavior

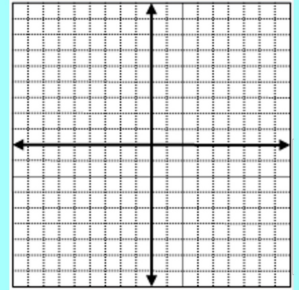
$$y = -|x| + 5$$



For each graph, do the following.

1. Find the vertex
2. Find the axis of symmetry
3. Use the slope and graph
4. Does it stretch or compress?
5. State the domain and range
6. Describe the end behavior

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



A translation is an operation that shifts a graph horizontally, vertically, or both. The graph will be the same size and shape, but in a different position.

Absolute Value equation: $y = |x - h| + k$ Vertex: (h, k)

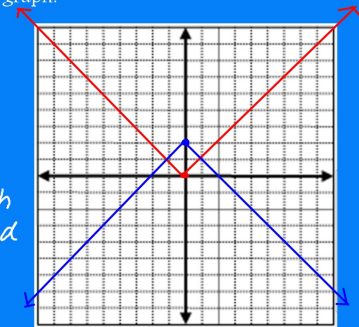
Parent Function. The simplest function of a group of functions with common characteristics. exs. $y = x^2$ $y = |x|$ $y = x$

Compare the graphs of the following pair of functions. Tell how the second graph relates to the first graph.

$$y = |x|$$

$$y = -|x| + 2$$

The second graph shifted up 2 and opens down



VERTICAL translation—shift up or down. Number is outside the parent function. k is the units the graph shifts vertically.

$$y = |x| + k \quad y = |x| - k$$

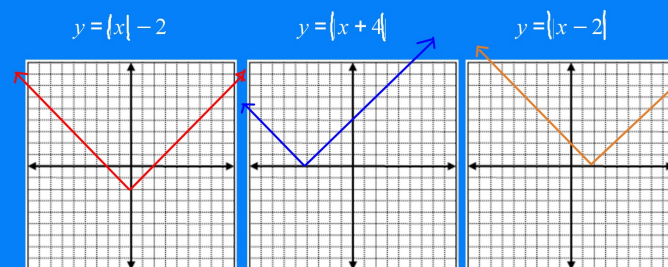
up *down*

HORIZONTAL translation—shift left or right. Number is inside the parent function. Shift the opposite way. h is the units the graph shifts horizontally.

$$y = |x - h| \quad y = |x + h|$$

right *left*

Graph the functions.



Write an equation for each translation.

$y = |3x|$ 2 units down and 6 units right

$$y = |3x - 18| - 2$$

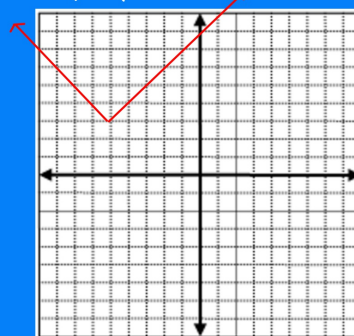
$y = -|x|$ 3 units left and 4 units up

$$y = -|x + 3| + 4$$

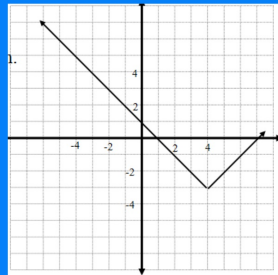
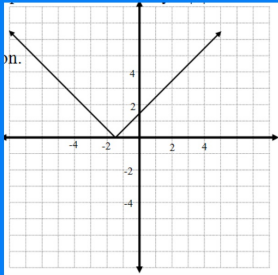
$y = \left|\frac{1}{3}x\right|$ 3 units up

$$y = \left|\frac{1}{3}x\right| + 3$$

Graph $f(x) = |x + 5| + 3$



Write the equations for the following translations.



Homework
page 88 # 2-18 even, 26
page 95 # 3-30 x 3