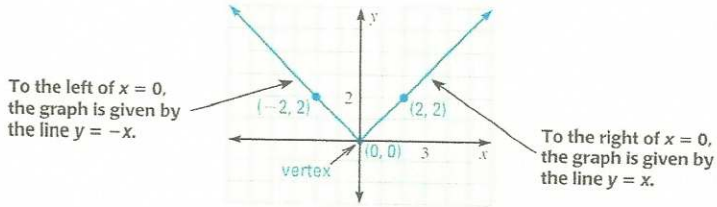
2.7 – Absolute Value Functions and Transformations

KEY CONCEPT *For Your Notebook*

Parent Function for Absolute Value Functions

The parent function for the family of all absolute value functions is $f(x) = |x|$. The graph of $f(x) = |x|$ is V-shaped and is symmetric about the y-axis. So, for every point (x, y) on the graph, the point $(-x, y)$ is also on the graph.



The highest or lowest point on the graph of an absolute value function is called the **vertex**. The vertex of the graph of $f(x) = |x|$ is $(0, 0)$.

Transformation – changes to the graphs size, shape, position, or orientation.

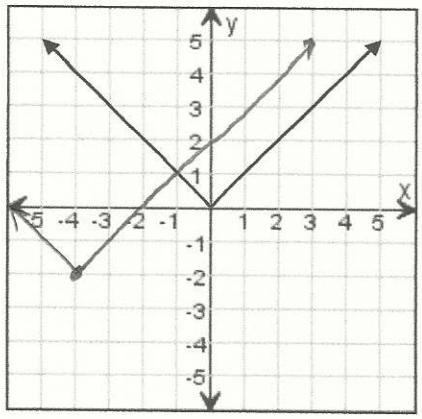
Translation – a transformation that shifts a graph horizontally and/or vertically

The graph of $y = |x - h| + k$ is the graph of $y = |x|$ translated h units horizontally and k units vertically, putting the vertex at (h, k)

Example 1 Graph $y = |x + 4| - 2$

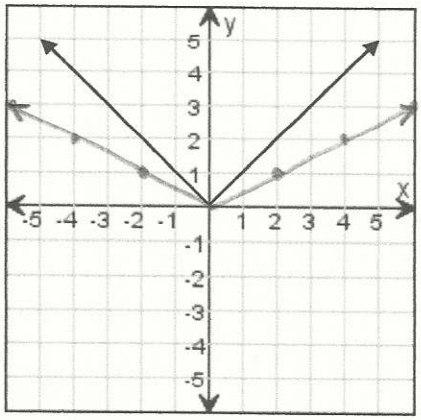
Id & plot vertex $(h, k) \Rightarrow (-4, -2)$

the slope is 1 because the coefficient of x is 1



Graphs of the form $y = a|x|$

Example 2 Graph (a) $y = \frac{1}{2}|x|$ and (b) $y = -3|x|$



Id vertex $(0, 0)$

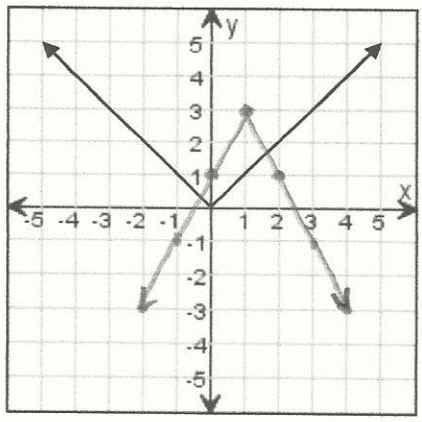
the slope is $\frac{1}{2} = \frac{\text{rise}}{\text{run}}$

Graphs of the form $y = a|x - h| + k$

Example 3 Graph $y = -2|x - 1| + 3$

Id vertex $(h, k) \Rightarrow (1, 3)$

$a = -2 = \text{slope} = \frac{-2}{1}$



GRAPHING FUNCTIONS Graph the function. *Compare* the graph with the graph of $y = |x|$.

3. $y = |x| - 7$
4. $y = |x + 2|$
5. $y = |x + 4| - 2$
6. $f(x) = |x - 1| + 4$
7. $f(x) = 2|x|$
8. $f(x) = -3|x|$
9. $y = -\frac{1}{3}|x|$
10. $y = \frac{3}{4}|x|$
11. $y = 2|x + 1| - 6$
12. $f(x) = -4|x + 2| - 3$
13. $f(x) = -\frac{1}{2}|x - 1| + 5$
14. $f(x) = \frac{1}{4}|x - 4| + 3$