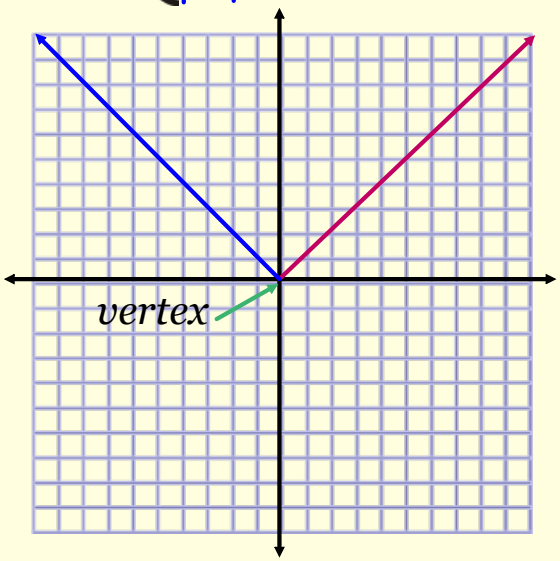
2.8 ABSOLUTE-VALUE FUNCTIONS

$f(x) = |x|$

defined as...

$$f(x) = \begin{cases} |x| = x & \text{if } x \geq 0 \\ |x| = -x & \text{if } x < 0 \end{cases}$$



Graphing Absolute Value Functions

Standard form $y = a|x - h| + k$

($-h$: opposite of what you see; k: exactly what we see)

1. The graph has vertex (h, k) and is symmetric in the line $x = h$.

2. The graph is V-shaped.
   It opens up if $a > 0$ and down if $a < 0$.

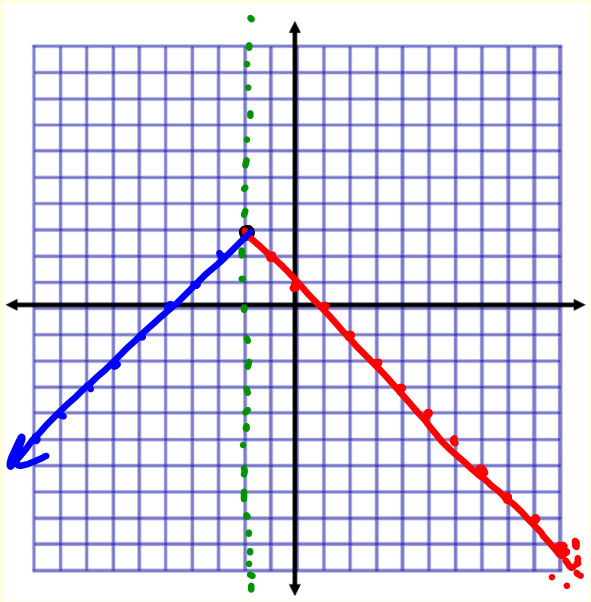
3. The graph is wide if $|a| < 1$.
   The graph is narrow if $|a| > 1$.

Example 1

Graph $y = -|x + 2| + 3$.

vertex: $(-2, 3)$

$a: -1 = \frac{-1}{1}$ ↓ →

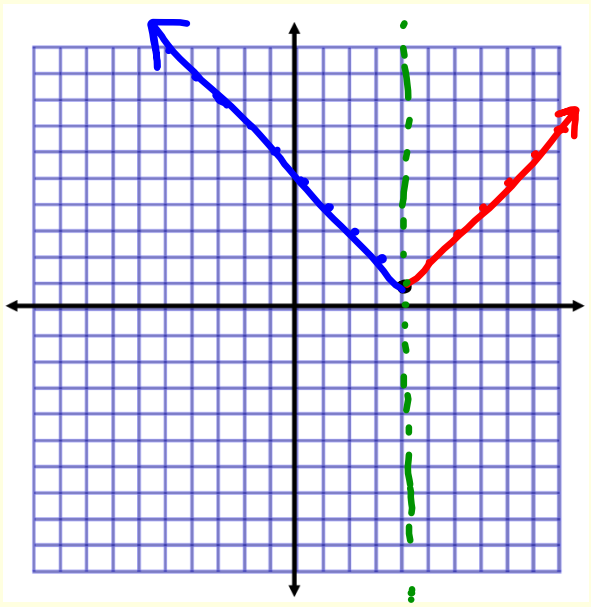


Example 2

Graph $y = 1|x - 4| + 1$.

vertex: $(4, 1)$

$a: 1 = \frac{1}{1}$ ↑ →

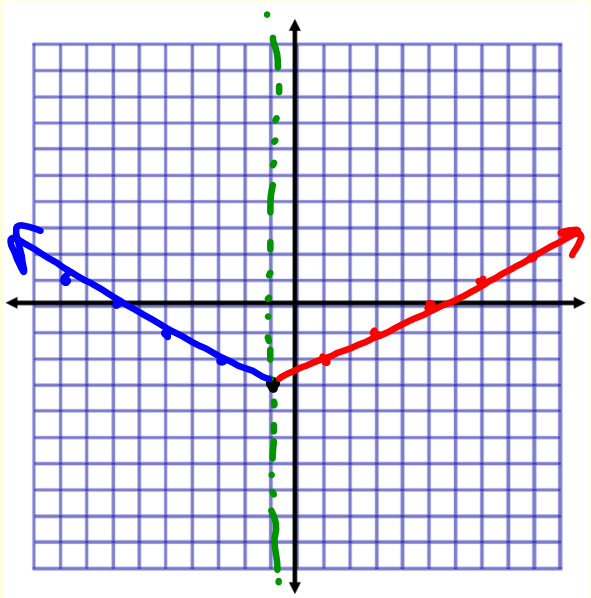


Example 3

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

vertex: $(-1, -3)$

$a: \frac{1}{2}$ ↑ 1 → 2

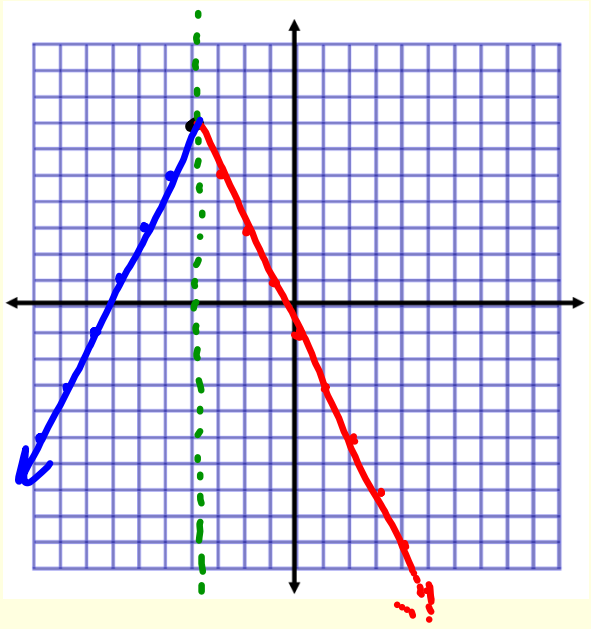


Example 4

Graph $y = -2|x + 4| + 7$.

vertex: $(-4, 7)$

$a: -2 = \frac{-2}{1}$ ↓ → ↓ ←

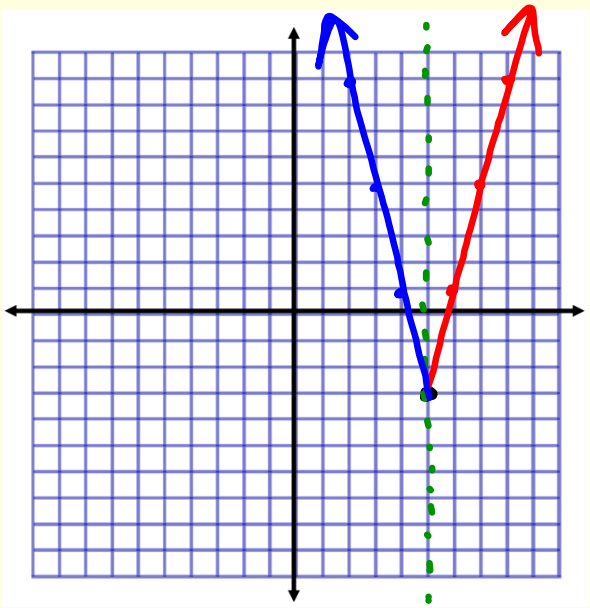


Example 5

Graph $y = 4|x - 5| - 3$.

vertex: $(5, -3)$

$a: 4 = \frac{4}{1}$ ↑ ↑ → ←



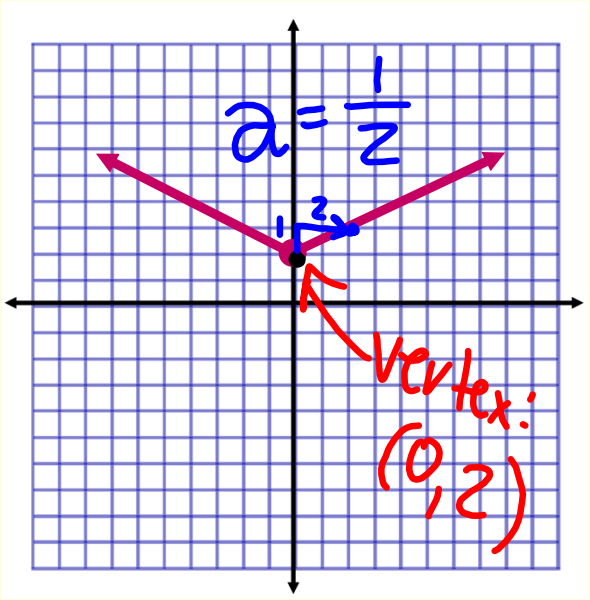
Example 6

Write an equation of the graph.

$y = a|x - h| + k$

$y = \frac{1}{2}|x - 0| + 2$

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



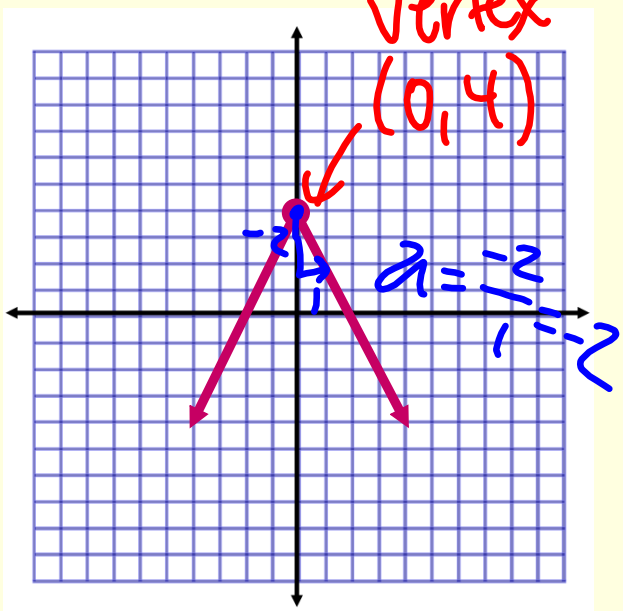
Example 7

Write an equation of the graph.

$y = a|x-h|+k$

$y = -2|x-0|+4$

$\boxed{y = -2|x|+4}$



Example 8

Write an equation of the graph.

$y = a|x-h|+k$

$\boxed{y = \frac{2}{3}|x+3|+2}$