Absolute Value Functions

The absolute value function turns its argument (the part inside the bars) into a positive output.

$|5| = 5 \qquad |-5| = 5$

Given: $f(x) = |3x - 2|$ and $g(x) = -2|3 - x| - 3$

Evaluate f(-3)

$f(-3) = |3(-3) - 2|$

$f(-3) = |-9 - 2|$

$f(-3) = |-11|$

$f(-3) = 11$

Evaluate g(1)

$g(1) = -2|3 - (1)| - 3$

$g(1) = -2|2| - 3$

$g(1) = -2 \times 2 - 3$

$g(1) = -4 - 3, \quad g(1) = -7$

The graph of abs. value looks like a “V.”

If there is a negative in front of the abs. value, then it faces downward “Λ”

Abs. value functions have a vertex (h, k) just like quadratics: $f(x) = a|x - h| + k$

Abs. value graphs are like two linear functions stuck together. They will have opposite sign slopes (i.e. 3 on one side and -3 on the other).

What are the slopes and vertex for each function?

Which way do the functions open?

$f(x) = \frac{-3}{2}|x - 3| + 1$

Vertex: (3, 1); Slopes: 3/2 and -3/2; Opens: down

$g(x) = |4x - 2| - 3$

Factor out a 4 inside first: $g(x) = \left|4\left(x - \frac{1}{2}\right)\right| - 3$

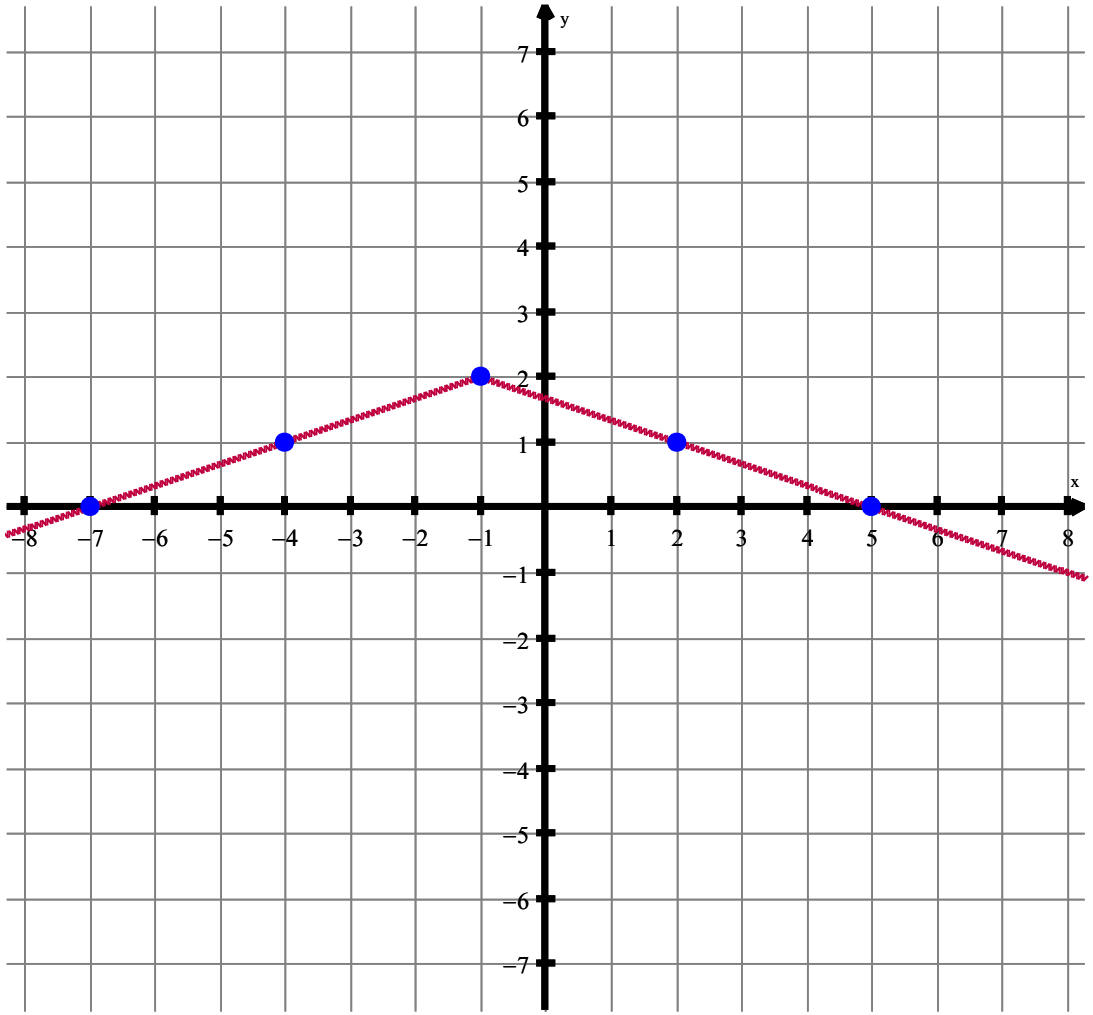
Vertex: (1/2, -3); Slopes: 4 and -4; Opens: up

$h(x) = \frac{1}{2}|-5x - 5| - 2$

Factor out a -5 inside first: $h(x) = \frac{1}{2}|-5(x + 1)| - 2$

Vertex: (-1, -2); Slopes: 5/2 and -5/2; Opens: up

Graph the function: f(x) = -1/3|x + 1| + 2



Vertex: $(-1, 2)$

Slopes: $1/3$ and $-1/3$

Opens: downward

y-intercept: $(0 , 1.\overline{6})$

x-intercept(s):(-7, 0) and (5, 0)

Decreasing: $(-1, \infty)$

Increasing: $(-\infty, -1)$

Domain: $(-\infty, \infty)$

Range: $(-\infty, 2]$

End behavior:

As $x \to \infty$, $f(x) \to -\infty$,

As $x \to -\infty$, $f(x) \to -\infty$