

# Absolute Value

*Drawing Mathematics with Desmos | Justin Skycak*

**Setup.** Navigate to <https://www.desmos.com/calculator>. Be sure to sign in so that you can save your graph.

**Demonstration - Absolute Value.** Observe the graph as you type each of the following inputs. In general, an absolute value graph  $y = m|x|$  makes a “V” shape, with the magnitude of  $m$  controlling the slope of the V, and the sign of  $m$  controlling whether the V opens upward or downward.

$$y = 5|x|$$

$$y = 1|x|$$

$$y = 0.1|x|$$

$$y = -0.1|x|$$

$$y = -1|x|$$

$$y = -5|x|$$

**Demonstration - Shifts.** Observe the graph as you type each of the following inputs. In general, the graph of  $y = m|x - a| + b$  shifts the absolute value graph  $y = m|x|$  so that the pointy part of the “V” occurs at the point  $(a, b)$ .

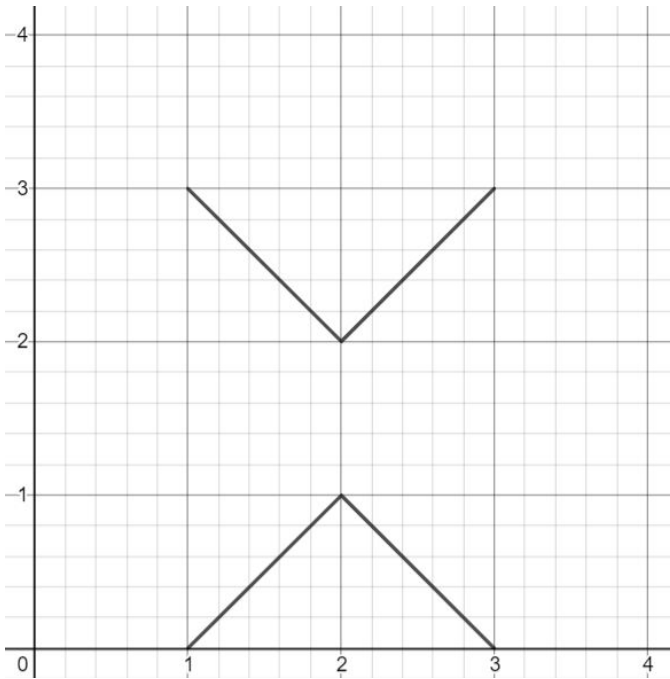
$$y = |x - 1| + 2$$

$$y = -2|x - 1| - 3$$

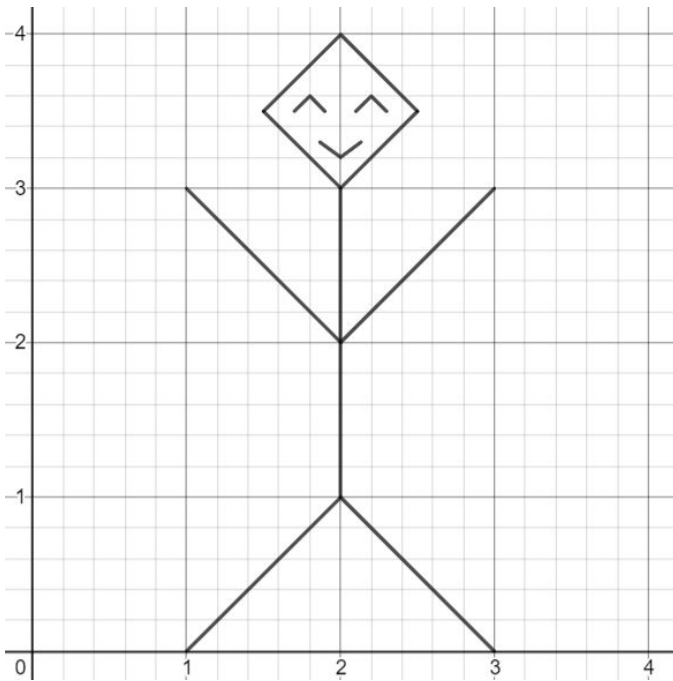
$$y = -0.5|x + 3| - 1$$

$$y = 10|x + 2| + 1$$

**Exercise.** Draw the two absolute value functions shown below.  
(Hint: Remember that you can limit the domain and range of your functions with parentheses, e.g.  $y = |x|\{-1 < x < 1\}$  or  $y = |x|\{y < 3\}$ )



**Exercise.** Draw more absolute value functions to create a person!  
(The person's back will be a vertical line, but everything else can be made out of absolute value functions.)



**Challenge.** Try to draw yourself, or your friend! You can include hair, shoes, ears, hands, clothes, etc.)