

Sketch the following piecewise function:

$$f(x) = \begin{cases} \text{Linear} \rightarrow 1) \frac{1}{2}x - 2 & \text{if } x < \underline{-2} \\ \text{Horizontal Line} \rightarrow 2) -1 & \text{if } -2 \leq x \leq 1 \\ \text{Parabola} \rightarrow 3) (x-2)^2 + 1 & \text{if } x > 1 \end{cases} \left. \vphantom{f(x)} \right\} \text{Boundary Numbers}$$

$v(2,1)$

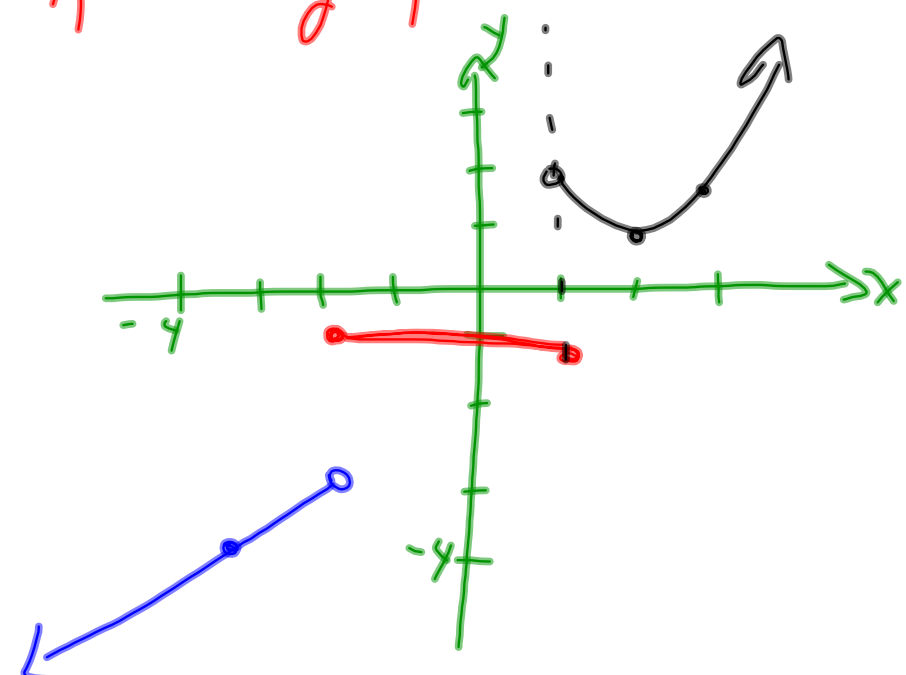
①

x	y
-2	-3
-4	-4

② Horizontal Line through  $y = -1$

③

x	y
1	2
2	1 ← vertex



$x=0$   
 $f(0) = -1$        $f(-2) = -1$        $f(1) = -1$

$f(-3) = -\frac{11}{2}$        $f(2) = 1$

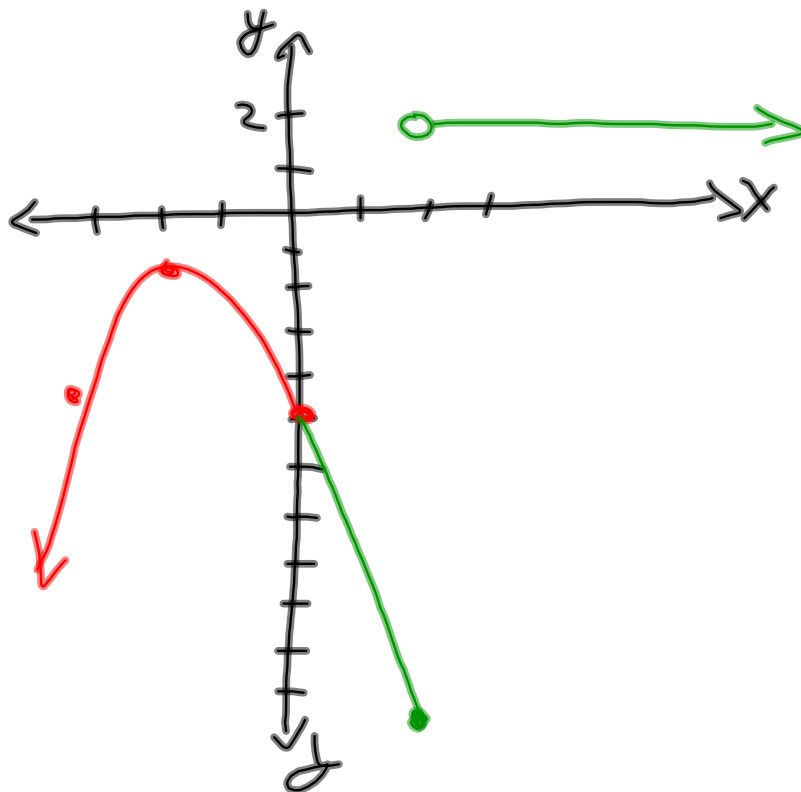
$$f(x) = \begin{cases} -(x+2)^2 - 1, & \text{if } x \leq 0 \\ -3x - 5, & 0 < x \leq 2 \\ 2, & \text{if } x > 2 \end{cases}$$

- 1) Evaluate  $f(0)$ ,  $f(2)$ , and  $f(-1)$   
 2) Sketch  $f(x)$

x	y
0	-5
-2	-1

x	y
0	-5
2	-11

$y = 2$



More Practice...

- Express the following absolute value function as a piecewise function
- Sketch the function

$$f(x) = (x+2)^2 - 5$$

$$V(-2, -5)$$

$$f(x) = |x-3| \leftarrow \text{V-Shaped}$$

$$V(3, 0) \leftarrow \text{Vertex}$$

$$f(x) = |x+2| - 5$$

$$V(-2, -5)$$

$$f(x) = \begin{cases} \text{Between Bars} \\ \text{Positive} \end{cases} \rightarrow \text{Just Drop the bars ...}$$

$$f(x) = |x|$$

$$\rightarrow f(x) = |6| = 6$$

Write without absolute Bars ... Between Bars Negative ...

$$f(x) = x$$

$$f(x) = |-6| = 6$$

$$\rightarrow f(x) = (-6)$$

MUST multiply between bars by a negative /

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

Between Bars Positive

$$x-3 > 0$$

$$x > 3$$

$$f(x) = x-3$$

Between Bars Negative

$$x-3 \leq 0$$

$$x \leq 3$$

$$f(x) = -(x-3)$$

$$f(x) = -x+3$$

$$f(x) = \begin{cases} x-3 & \text{if } x > 3 \\ -x+3 & \text{if } x \leq 3 \end{cases}$$

Represent as a piecewise function ...

$$f(x) = 3|x+7| - 2$$

BBP

$$\begin{aligned}x+7 &\geq 0 \\x &\geq -7\end{aligned}$$

$$\begin{aligned}f(x) &= 3(x+7) - 2 \\&= 3x + 19\end{aligned}$$

BBN

$$\begin{aligned}x+7 &< 0 \\x &< -7\end{aligned}$$

$$\begin{aligned}f(x) &= -3(x+7) - 2 \\&= -3x - 21 - 2 \\&= -3x - 23\end{aligned}$$

$$f(x) = \begin{cases} 3x + 19, & \text{if } x \geq -7 \\ -3x - 23, & \text{if } x < -7 \end{cases}$$