Let's try to express these absolute value functions as piecewise defined functions...

Remember the following:

	If $\lvert x\rvert = 6$	
then	$x = 6$	$x = -6$

$|6| = 6$
$6 = 6$

- Must examine the TWO possible cases that exist

$y = |x+3|$

Case 1: BBP (Between Bars Positive)

(1) What will make BBP?

If $x+3 \geq 0$
$x \geq -3$ Then $y = x+3$

Case 2: BBN (Between Bars Negative)

If $x+3 < 0$
$x < -3$ Then

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

$|-6| = 6$
$-1(-6) = 6$
$6 = 6$

*multiply between bars by negative

Piecewise function:

$$y = \begin{cases} x+3 & \text{if } x \geq -3 \\ -x-3 & \text{if } x < -3 \end{cases}$$

$y = 2|x-5| + 4$ ⟵ Write as piecewise

Case 1: BBP

$x - 5 > 0 \Rightarrow y = 2(x-5)+4$

$x > 5$

$y = 2x - 10 + 4$

$y = 2x - 6$

Case 2: BBN

$x - 5 \leq 0 \Rightarrow y = -2(x-5)+4$

$x \leq 5$

$y = -2x + 10 + 4$

$y = -2x + 14$

$$y = \begin{cases} 2x - 6 & \text{if } x > 5 \\ -2x + 14 & \text{if } x \leq 5 \end{cases}$$

$$y = -4|3x+8| - 5$$

BBP

$3x+8 \geq 0 \Rightarrow y = -4(3x+8) - 5$

$3x \geq -8$

$y = -12x - 32 - 5$

$x \geq -\frac{8}{3}$

$y = -12x - 37$

BBN

$3x+8 < 0 \Rightarrow y = 4(3x+8) - 5$

$x < -\frac{8}{3}$

$y = 12x + 32 - 5$

$y = 12x + 27$

$$\boxed{y = \begin{cases} -12x - 37 & \text{if } x \geq -\frac{8}{3} \\ 12x + 27 & \text{if } x < -\frac{8}{3} \end{cases}}$$

$$y = \frac{3}{4}|8x - 4| + 3$$

BBP

$8x - 4 > 0 \Rightarrow y = 6x - 3 + 3$

$8x > 4$

$y = 6x$

$x > \frac{1}{2}$

BBN

$8x - 4 \leq 0 \Rightarrow y = -6x + 3 + 3$

$x \leq \frac{1}{2}$

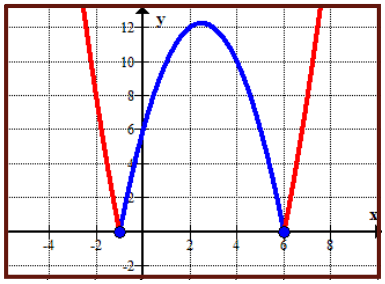
$y = -6x + 6$

$$\boxed{y = \begin{cases} 6x & \text{if } x > \frac{1}{2} \\ -6x + 6 & \text{if } x \leq \frac{1}{2} \end{cases}}$$

Chapter 7

Graph an Absolute Value Function

What would the sketch of the absolute value function $y = |-x^2 + 5x + 6|$ look like? Use this sketch to help you express the function as a piecewise function.



BBP

$-x^2+5x+6>0,\ y=-x^2+5x+6$??

BBN

$-x^2+5x+6<0$??

$y=x^2-5x-6$

Look at sketch!!!

Sketch: $y=-x^2+5x+6$ (Need x-Intercepts)

$0=-x^2+5x+6$

$0=x^2-5x-6$

$0=(x-6)(x+1)$

$x=6,-1$

x-coord. of vertex:

$x=\frac{6+-1}{2}=2.5$

$y=-(2.5)^2+5(2.5)+6$

$y=12.25$

BBP

$$y=\begin{cases}-x^2+5x+6 & \text{if } -1\le x\le 6\\ x^2-5x-6 & \text{if } x<-1 \text{ or } x>6\end{cases}$$

BBN

Express each of the following as piecewise defined functions:

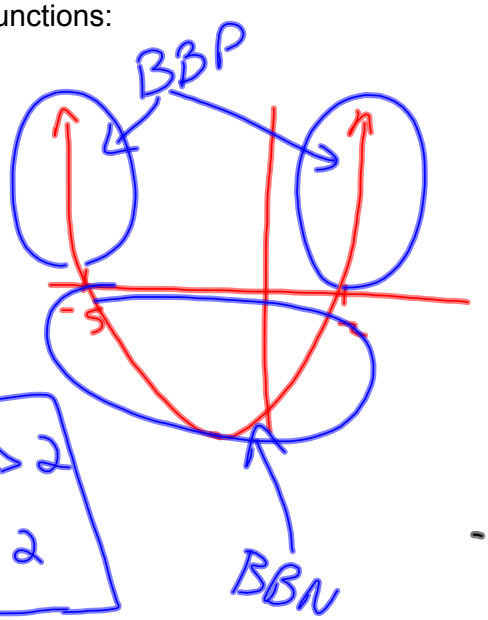
$y = |x^2 + 3x - 10|$

$+ \; x^2 + 3x - 10 = 0$

$(x+5)(x-2) = 0$

"opens" up $\quad x = -5, 2$

"BBP"



$$y = \begin{cases} x^2 + 3x - 10 & \text{if } x < -5 \text{ or } x > 2 \\ -x^2 - 3x + 10 & \text{if } -5 \leq x \leq 2 \end{cases}$$

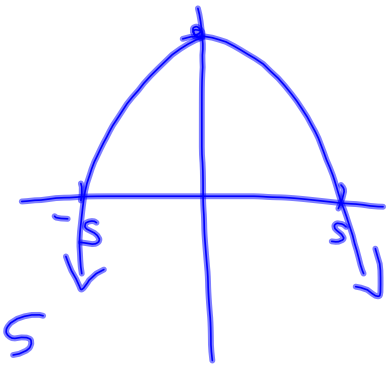
$f(x) = |-x^2 + 25|$

opens down

$25 - x^2 = 0$

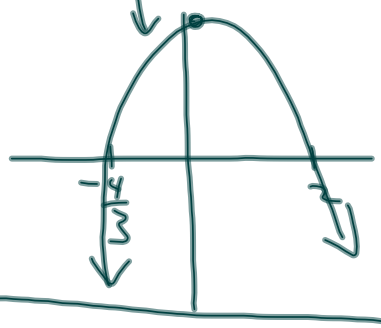
$(5-x)(5+x) = 0$

$x = \pm 5$



$$y = \begin{cases} -x^2 + 25 & \text{if } -5 < x < 5 \\ x^2 - 25 & \text{if } x \leq -5 \text{ or } x \geq 5 \end{cases}$$

$$f(x) = \left| -3x^2 + 2x + 8 \right|$$



$$-3x^2+2x+8=0$$
$$3x^2-2x-8=0$$
$$3x^2-6x+4x-8=0$$
$$3x(x-2)+4(x-2)=0$$
$$(x-2)(3x+4)=0$$
$$x=2,\ -\frac{4}{3}$$

$$\boxed{y=\begin{cases} -3x^2+2x+8 & \text{if } -\frac{4}{3}\leq x\leq 2 \\ 3x^2-2x-8 & \text{if } x<-\frac{4}{3} \text{ or } x>2 \end{cases}}$$

Chapter 7

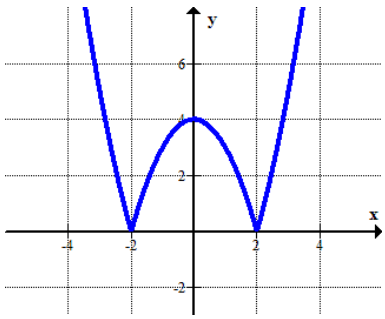
Absolute Value as a Piecewise Function

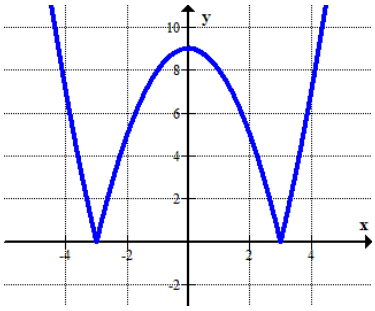
Match the piecewise definition with the graph of an absolute value function.

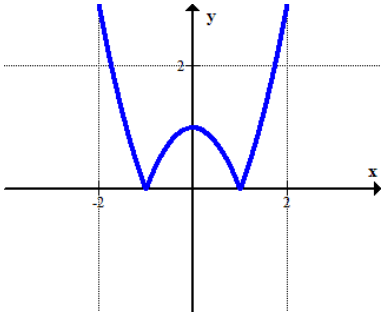
$$y = \begin{cases} x^2 - 1 & \text{if } x < -1 \text{ or } x > 1 \\ -(x^2 - 1) & \text{if } -1 \le x \le 1 \end{cases}$$

$$y = \begin{cases} x^2 - 4 & \text{if } x < -2 \text{ or } x > 2 \\ -(x^2 - 4) & \text{if } -2 \le x \le 2 \end{cases}$$

$$y = \begin{cases} x^2 - 9 & \text{if } x < -3 \text{ or } x > 3 \\ -(x^2 - 9) & \text{if } -3 \le x \le 3 \end{cases}$$







_____ _____ _____

Click here for the solution.

Practice Problems:

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