

Absolute Value

Before we start sticking a bunch of X's in these things, let's remember what they are.

Look at a few examples:

$$|5| = \blacksquare$$

$$|0| = \blacksquare$$

$$|-3| = \blacksquare$$

So...

What do absolute values do to positive numbers?

\blacksquare

What do absolute values do to 0?

\blacksquare

What do absolute values do to negative numbers?

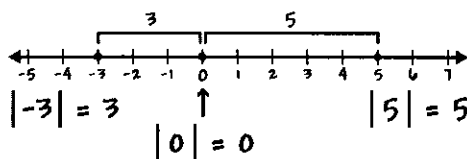
\blacksquare

Why are the answers to absolute value guys never negative?

\blacksquare

Check this out:

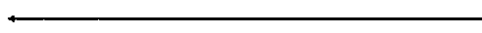
The real way to look at absolute values is that they are a number's distance from 0 on the number line:



TRY IT:

Use a number line to show the answers to these

$$|-2| \quad |4|$$



Let's start with something really simple... If you keep this guy in your head and THINK, you'll always know how to do these.

Look at this guy:

$$|x| = 3$$

Think about it... What could X be?

$$|-3| = \text{○} \text{ OR } |3| = \text{○}$$

$$\text{So, } x = \text{○} \text{ or } x = \text{○}$$

(We use an "or" \blacksquare)

TRY IT:

$$|x| = 7$$

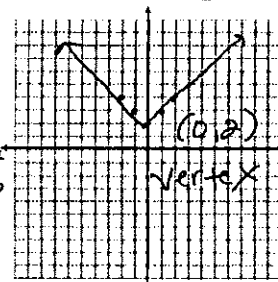
What could X be?

#1 Find the vertex, make a table and graph. (6.8)

Day 60

$$y = |x| + 2$$

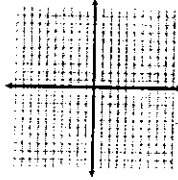
X	Y
-2	$-2 + 2 = 2 + 2 = 4$
-1	$-1 + 2 = 1 + 2 = 3$
0	$0 + 2 = 0 + 2 = 2$
1	$1 + 2 = 1 + 2 = 3$
2	$2 + 2 = 2 + 2 = 4$



2

Find the vertex, make a table and graph.

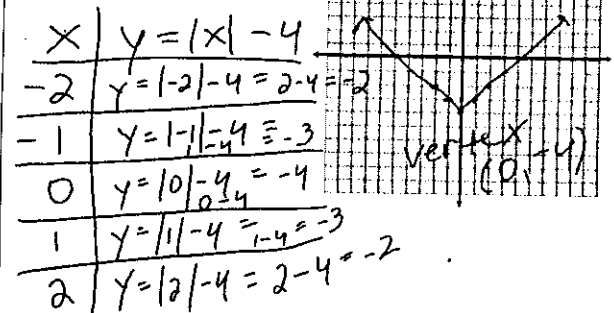
$$y = |x| + 1$$



3

Find the vertex, make a table and graph.

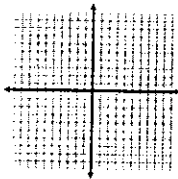
$$y = |x| - 4$$



4

Find the vertex, make a table and graph.

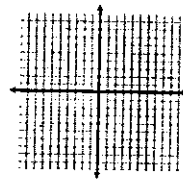
$$y = |x| - 6$$



5

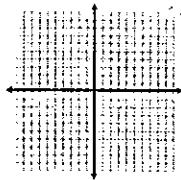
Find the vertex, make a table and graph.

$$y = |x| + 8$$



#6 Find the vertex, make a table and graph.

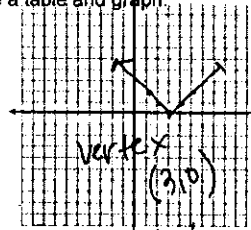
$$y = |x| - 2.5$$



#7 Find the vertex, make a table and graph.

$$y = |x - 3|$$

$$\begin{aligned} x - 3 &= 0 \\ +3 &+3 \\ x &= 3 \end{aligned}$$



x	y
1	$ 1-3 = -2 = 2$
2	$ 2-3 = -1 = 1$
3	$ 3-3 = 0 = 0$
4	$ 4-3 = 1 = 1$
5	$ 5-3 = 2 = 2$

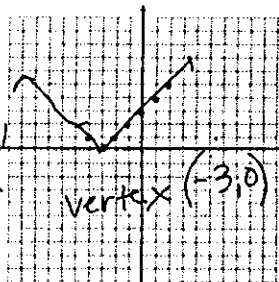
$y = |x| - 3$

x	y
0	

#8 Find the vertex, make a table and graph.

$$y = |x + 3|$$

x	y = x+3
-2	$y = -2+3 = 1 = 1$
-1	$y = -1+3 = 2 = 2$
0	$y = 0+3 = 3 = 3$
1	$y = 1+3 = 4 = 4$
2	$y = 2+3 = 5 = 5$
-3	$y = -3+3 = 0$
-4	$y = -4+3 = -1 = 1$



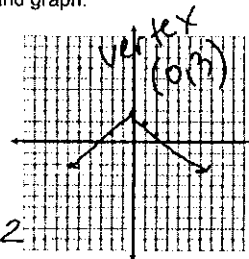
$$\begin{aligned} x + 3 &= 0 \\ -3 &-3 \\ x &= -3 \end{aligned}$$

-5
-4
-3
-2
-1

#9 Find the vertex, make a table and graph.

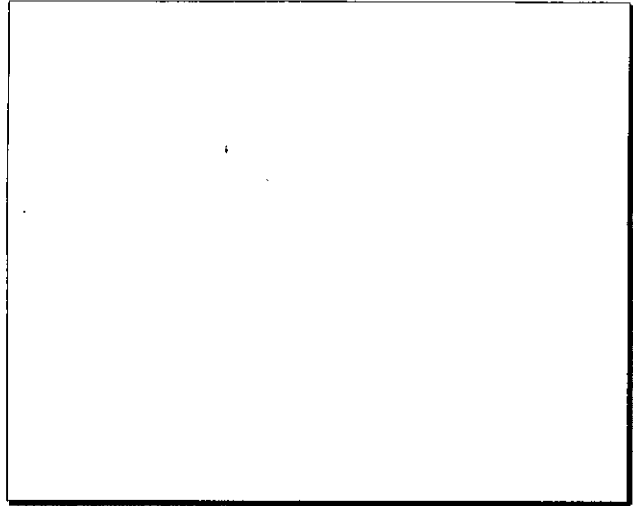
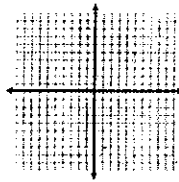
$$y = -|x| + 3$$

x	y = - x + 3
-2	$y = - -2 + 3 = -2 + 3 = 1$
-1	$y = - -1 + 3 = -1 + 3 = 2$
0	$y = - 0 + 3 = 0 + 3 = 3$
1	$y = - 1 + 3 = -1 + 3 = 2$
2	$y = - 2 + 3 = -2 + 3 = 1$



10 Find the vertex, make a table and graph.

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

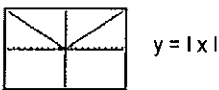


Graphing Absolute Value Functions

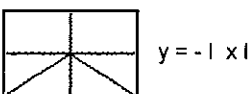
Standard Form: $Y = a|x + b| + c$

The a value will decide if a reflection is present.

Positive =



Negative =



Examples:

$y = -2|x + b| + c$ vs. $y = 2|x + b| + c$

Horizontal Shift

A horizontal shift, along the x-axis.

If the inside of the absolute value bars look like this

$$y = |x - b|$$

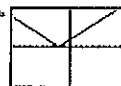
the absolute value graph will be shifted to the RIGHT of the origin b units



If the inside of the absolute value bars look like this

$$y = |x - (-b)| \text{ or } |x + b|$$

the absolute value graph will be shifted to the LEFT of the origin b units

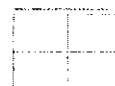


Examples:

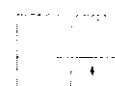
1.) $|x - 6|$



2.) $|x - (-5)|$



3.) $|x + 2|$



vs.

Vertical Shift

A vertical shift, along the y-axis

If the "c" value is positive the absolute value graph will move above (up) the origin "c" units.

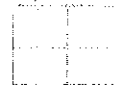
$$y = |x| + c$$

If the "c" value is negative the absolute value graph will move below (down) the origin "c" units.

$$y = |x| - c$$

Examples:

1.) $|x| + 5$



2.) $|x| - 3$



3.) $|x| + 2$



Combination Horizontal and Vertical
(both vertical and horizontal)

$Y = |x-4|+5$ ref
HS
VS

1. a horizontal shift of 4 units to the right of the origin, and
2. a vertical shift of 5 units above the origin.

$Y = -|x+9|-7$ ref-down
HS-left 5
VS-down 7

1. a horizontal shift of 5 units to the left of the origin,
2. a vertical shift of 7 units below the origin, and
3. a reflection.

$-|x+9|-7$

$y = |x+6|$ ref-
hs-
vs-

$y = -|x-(-4)|+2$ ref-
hs-
vs-

$y = |x-3|+2$ ref-

- ① $y = |x+2|+3$
ref, HS, VS
- ② $y = |x-2|-3$
ref, HS, VS
- ③ $y = -|x+2|-3$
ref HS VS
- ④ $y = -|x-2|+3$
ref HS VS

$y = |x|-6$

x	-2	-1	0	1	2
y			vertex		

$x-6=0$
 $+6+6$
 $x=6$

x	4	6	8
y		vertex 0	

$y = -|x|+7$

x	-7	-6	-5	-4	-3	-2	-1	0	1	2
y			vertex							

$x-7=0$
 $+7+7$
 $x=7$

x	5	6	7
y			vertex 0

$y = |x+3|-1$

$x+3=0$
 $-3-3$
 $x=-3$

x	-3	-4	-5	-6	-7
y					
vertex					

$y = |x-2|+4$

$x-2=0$
 $+2+2$
 $x=2$

x	0	1	2	3	4
y					
vertex					

$y = |x+3|-1$

x	-3	-4	-5	-6	-7
y					
vertex					

$V = (-3, -1)$
vertex

$y = |x-2|+4$

x	0	1	2	3	4
y					
vertex					

vertex $(2, 4)$

Wkbk p.359
(1-21 odd)

make table,
Find vertex
Graph