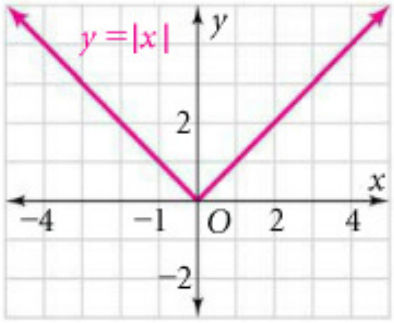
Translating Graphs of Absolute Value Equations

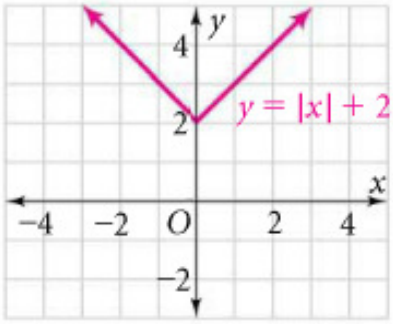
A V-shaped graph that points upward or downward is the graph of an **absolute value equation.**

x	$y = \|x\|$	y
−3		
−2		
−1		
0		
1		
2		
3		

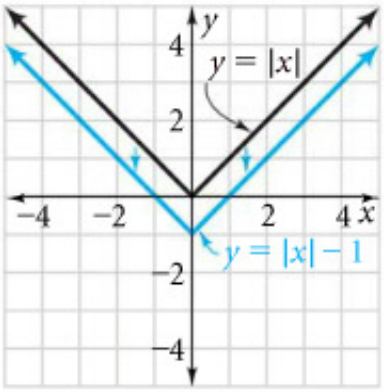
Below are the graphs of $y = |x|$ and $y = |x| + 2$. Describe how the graphs are the same and how they are different.

Ex1a)



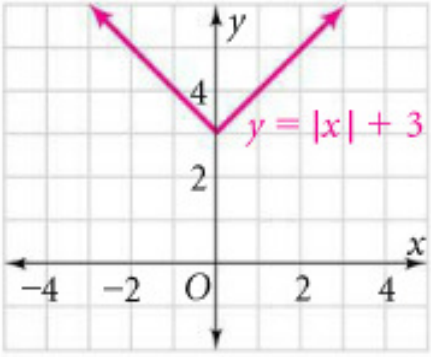


Graph $y = |x| - 1$.

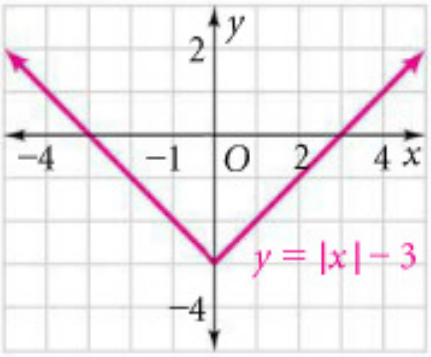


Describe how each graph below is like $y = |x|$ and how it is different.

a.



b.



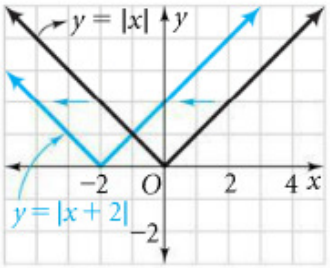
What would happen to these graphs?

The equation is $y = |x| - 8$.

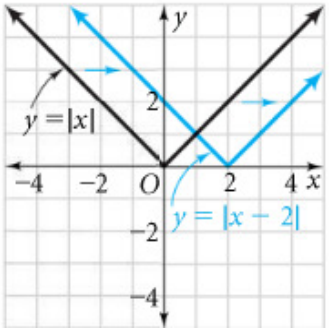
The equation is $y = |x| + 6$.

Ex1b) How are these different than the last several examples?

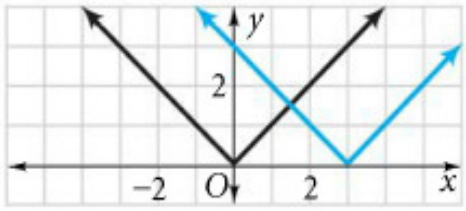
a. $y = |x + 2|$

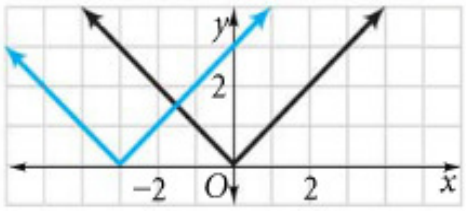


b. $y = |x - 2|$



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





What would happen to these graphs?

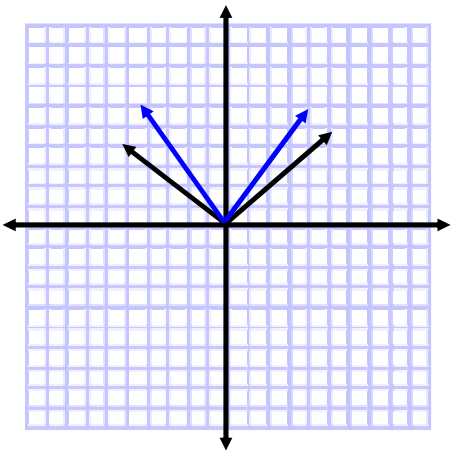
a. $y = |x - 4|$

b. $y = |x + 1|$

Ex1c) How does these graphs different and what changes?

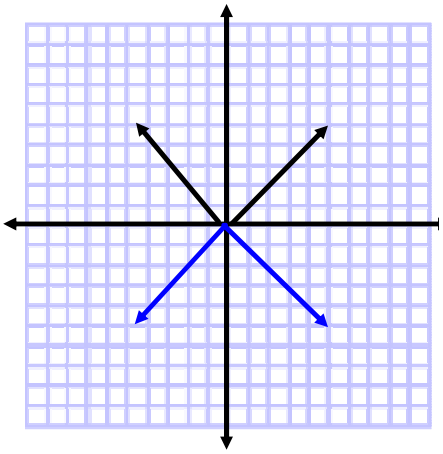
y =2|x|

x	y
-3	6
-2	4
-1	2
0	0
1	2
2	4
3	6



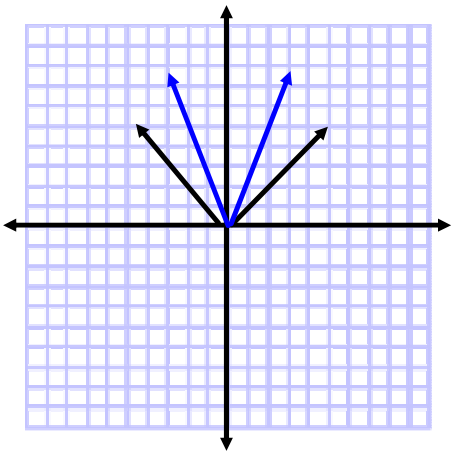
y = -|x|

x	y
-3	-3
-2	-2
-1	-1
0	0
1	-1
2	-2
3	-3



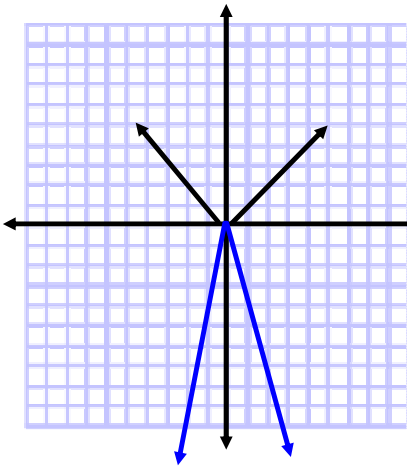
y = 3|x|

x	y
-3	9
-2	6
-1	3
0	0
1	3
2	6
3	9



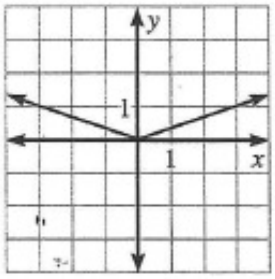
y = -4|x|

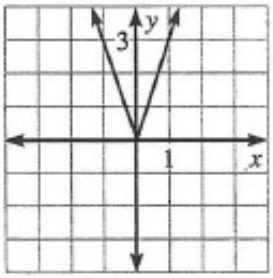
x	y
-3	-12
-2	-8
-1	-4
0	0
1	-4
2	-8
3	-12

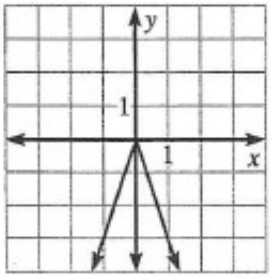


TRY **EXAMINING THE EFFECT OF *a*** Match the function with its graph.

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

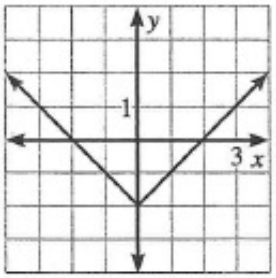
A. 

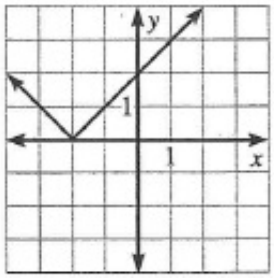
B. 

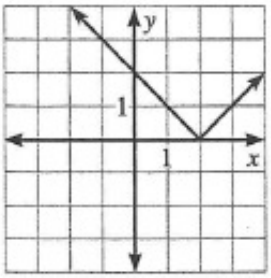
C. 

EXAMINING THE EFFECTS OF *h* AND *k* Match the function with its graph.

4. $y = |x - 2|$ 5. $y = |x| - 2$ 6. $y = |x + 2|$

A. 

B. 

C. 

The graph of $y = m|x - h| + k$ has the following characteristics.

- The graph has vertex (h, k) and is symmetric in the line $x = h$.
- The graph is V-shaped. It opens up if $m > 0$ and down if $m < 0$.
- The graph is wider than the graph of $y = |x|$ if $|m| < 1$.
  The graph is narrower than the graph of $y = |x|$ if $|m| > 1$.

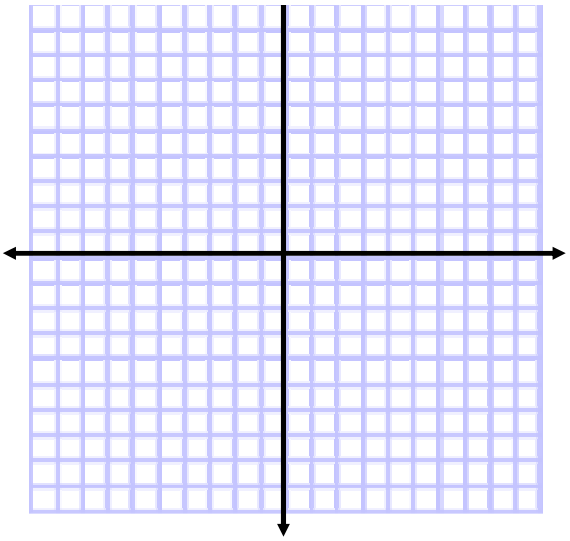
To graph:
1. plot the vertex (h,k)
2. use m to find the points from your vertex
   on the right hand side of the line
3. then the points of the left hand side would be the reflection of the right.

* Go back to the previous page and look and the try problems and see that it works for them. What is the vertex and the slope?

Ex2a) $y = |x + 3| + 2.$

What is the vertex?

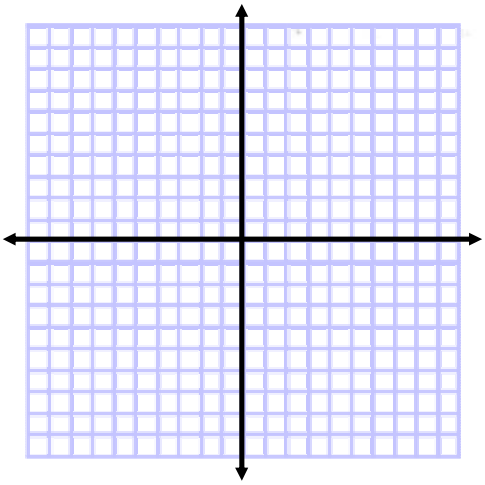
What is the slope?



Ex2b) $y = 2|x - 4| + 3$

What is the vertex?

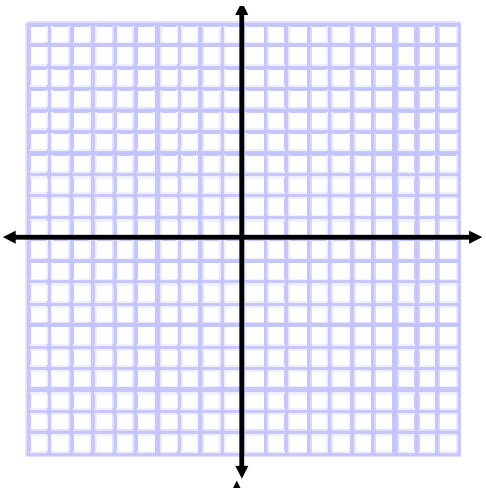
What is the slope?



Ex2c) $y = -2|x + 9| + 3$

What is the vertex?

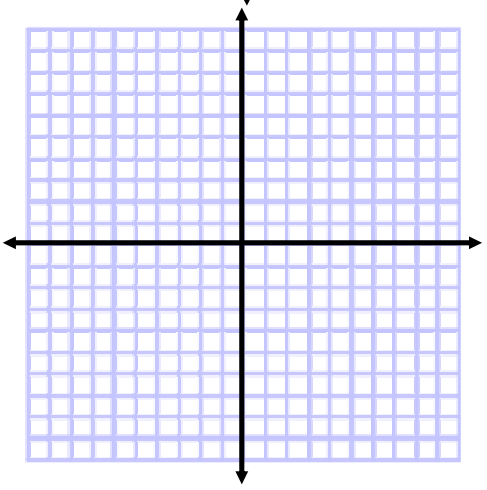
What is the slope?



Ex2d) $y = \frac{1}{3}|x - 3| + 4$

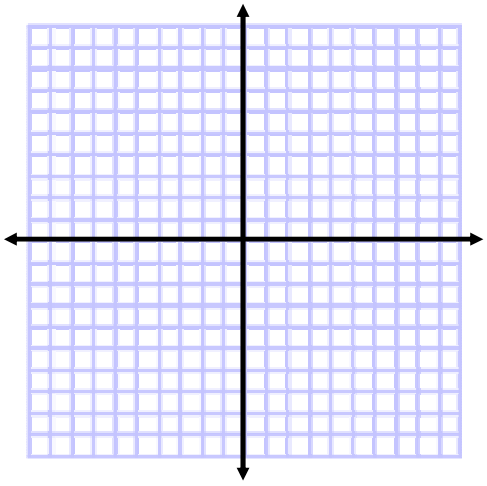
What is the vertex?

What is the slope?



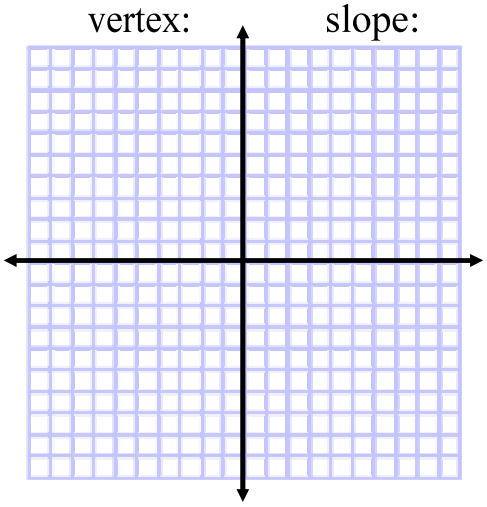
Try: $y = |x + 5|$

vertex: slope:



$y = \frac{1}{2}|x|$

vertex: slope:



$y = -2|x + 9| + 3$

vertex: slope: