

# Transformations of Functions

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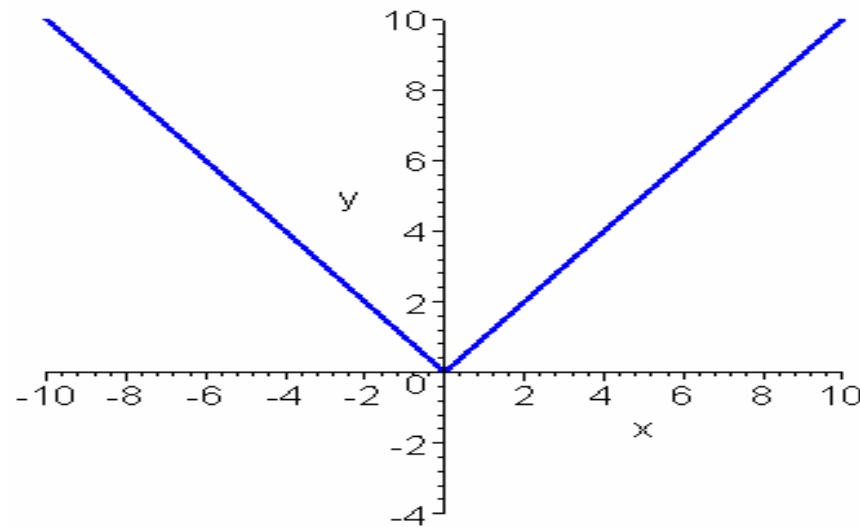
**Mathematics Enrichment  
through Technology**



# Absolute Value

$$y = |x|$$

An Absolute Value graph is always in a “V” shape.



Given the following function,

$$y = |x| + a$$

If:  $a > 0$ , then shift the graph “ $a$ ” units up

If:  $a < 0$ , then shift the graph “ $a$ ” units down

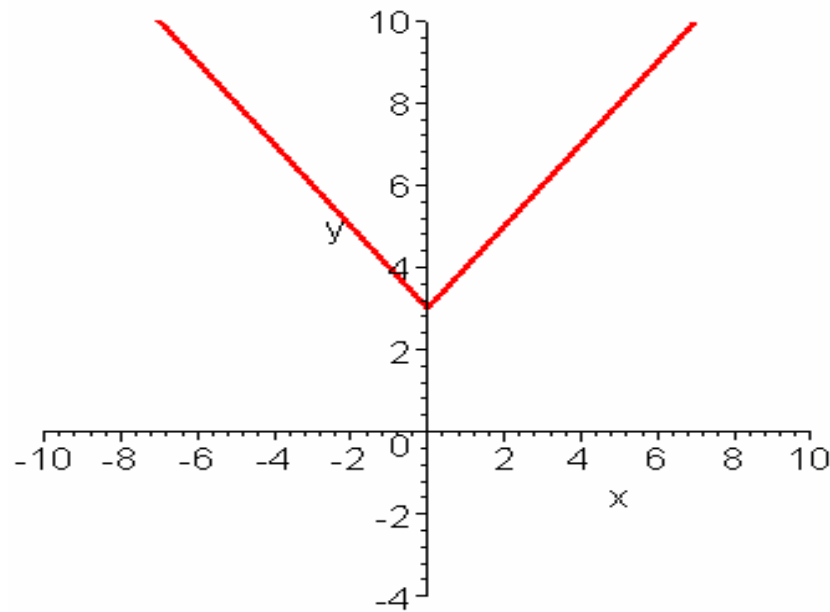
Given the following function,

$$y = |x| + 3$$

Since  $a > 0$ , then shift the  
graph “3” units up

# Let's Graph

$$y = |x| + 3$$

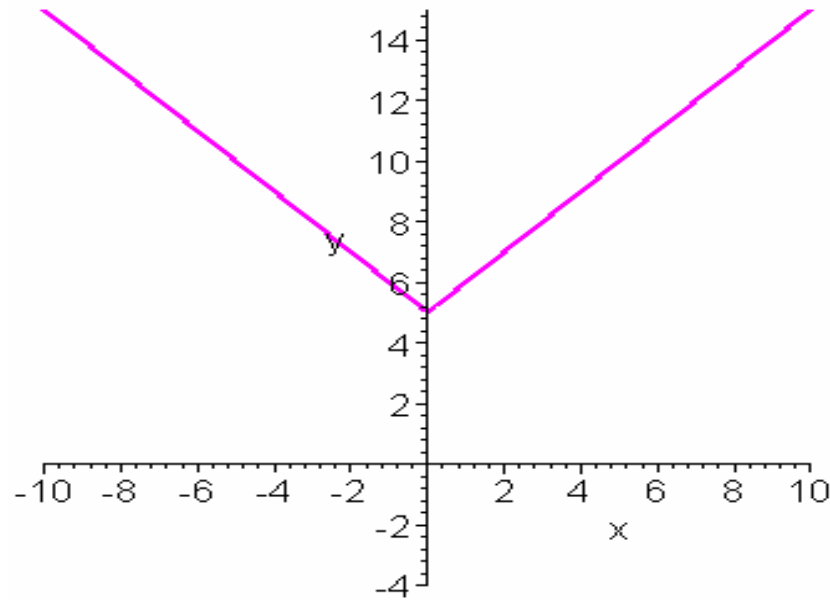


$$y = |x| + 5$$

How will the  
graph look?

# Let's Graph

$$y = |x| + 5$$



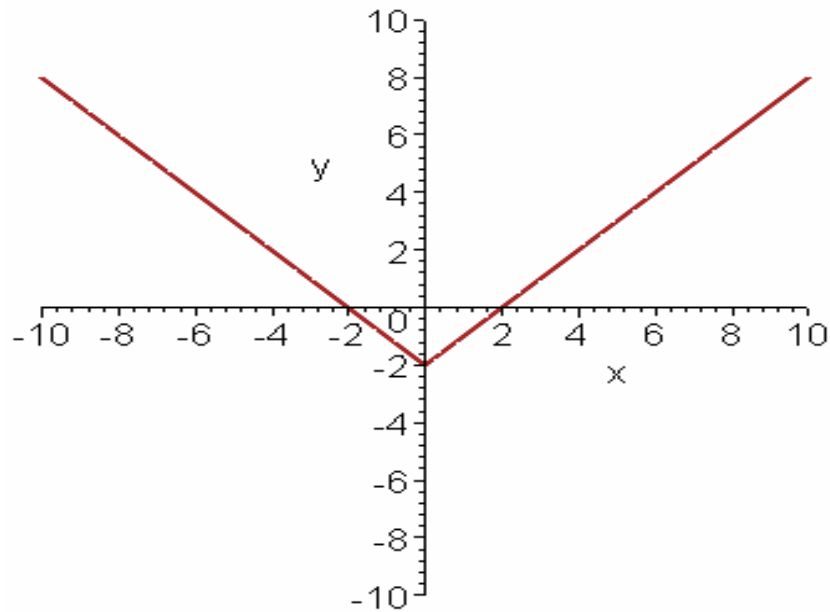
$$y = |x| - 2$$

How will the  
graph look?



# Let's Graph

$$y = |x| - 2$$

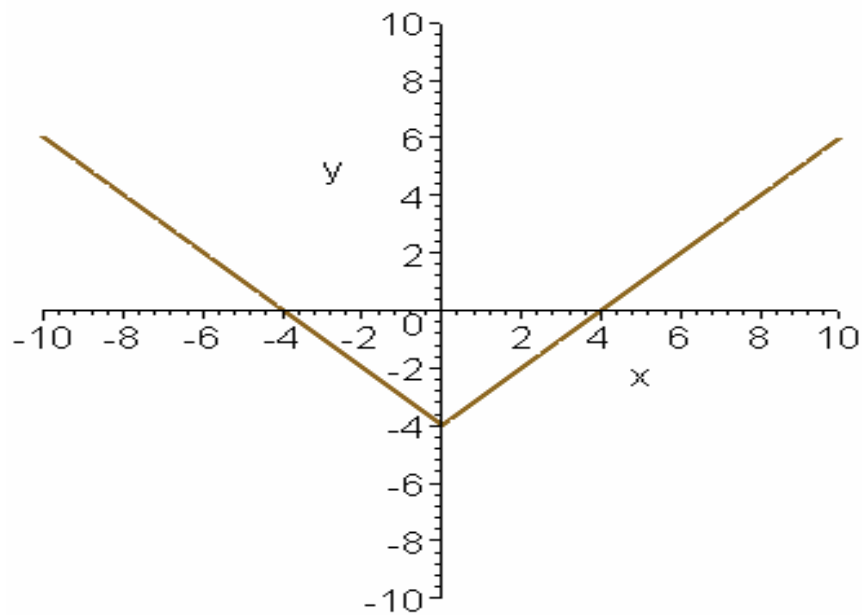


$$y = |x| - 4$$

How will the  
graph look?

# Let's Graph

$$y = |x| - 4$$



Given the following function,

$$y = |x - b|$$

We get the expression  $(x - b)$   
and equal it to zero

$$x - b = 0$$

$$x = b$$

If:  $b > 0$ , then shift the graph  
“ $b$ ” units to the right

If:  $b < 0$ , then shift the graph  
“ $b$ ” units to the left

Given the following function,

$$y = |x - 1|$$

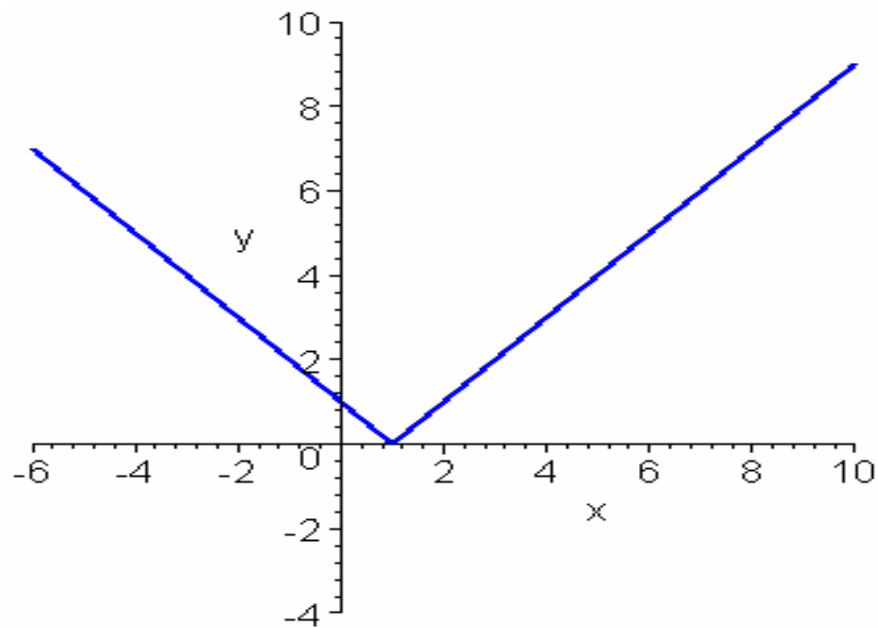
$$x - 1 = 0$$

$$x = 1$$

Since  $1 > 0$ , then shift  
the graph “1” unit right

# Let's Graph

$$y = |x - 1|$$

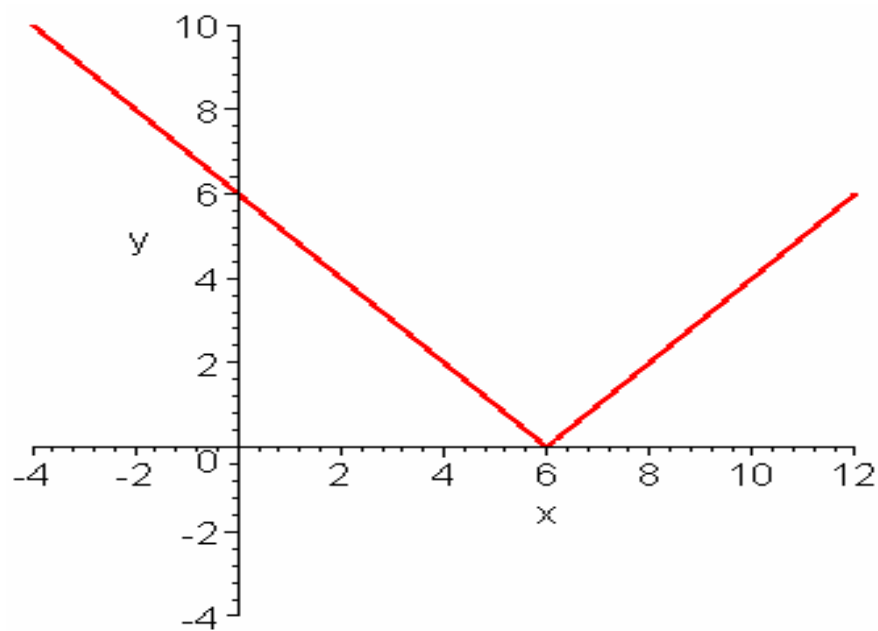


$$y = |x - 6|$$

How will the  
graph look?

# Let's Graph

$$y = |x - 6|$$



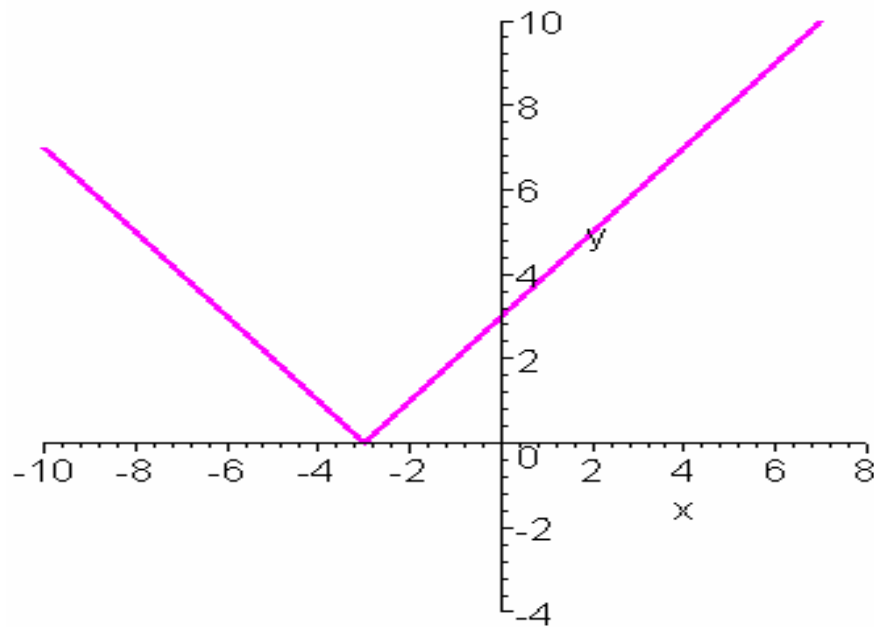


$$y = |x + 3|$$

How will the  
graph look?

# Let's Graph

$$y = |x + 3|$$

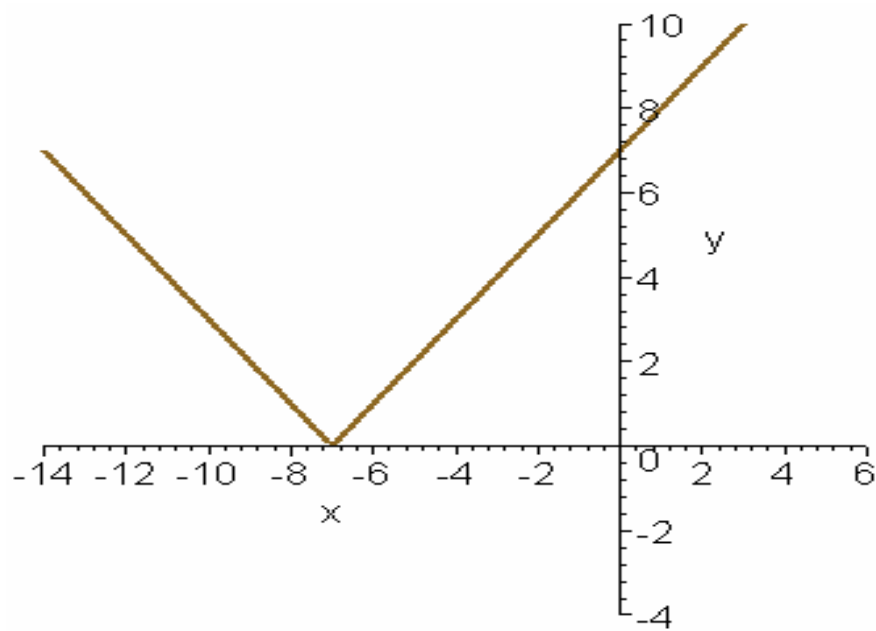


$$y = |x + 7|$$

How will the  
graph look?

# Let's Graph

$$y = |x + 7|$$



# Graphing

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

Recall: Shift "3" units up since  $3 > 0$   
then we use the expression  $x + 1$ ,  
and equal it to zero

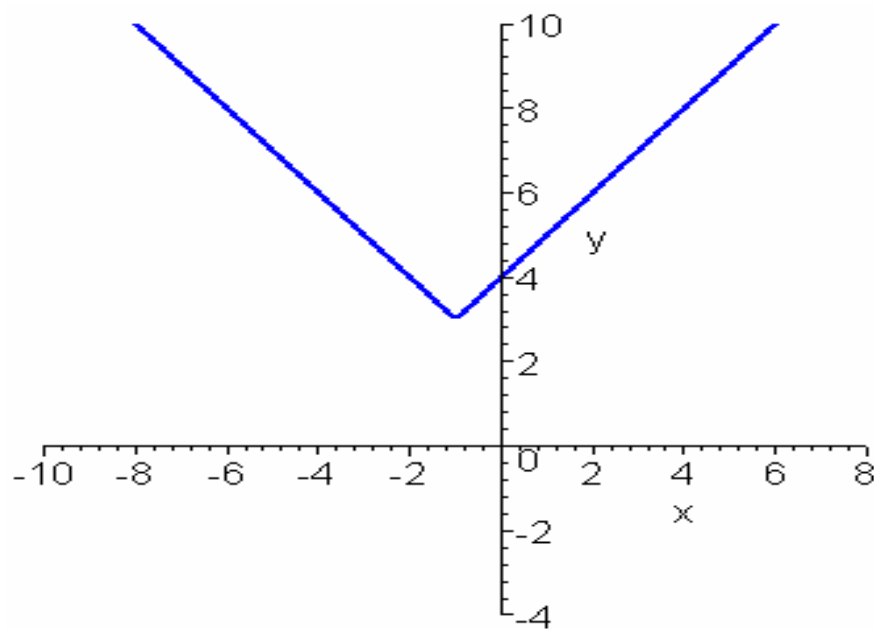
$$x + 1 = 0$$

$$x = -1$$

Since  $-1 < 0$ , then we shift  
"1" unit to the left

# Let's Graph

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

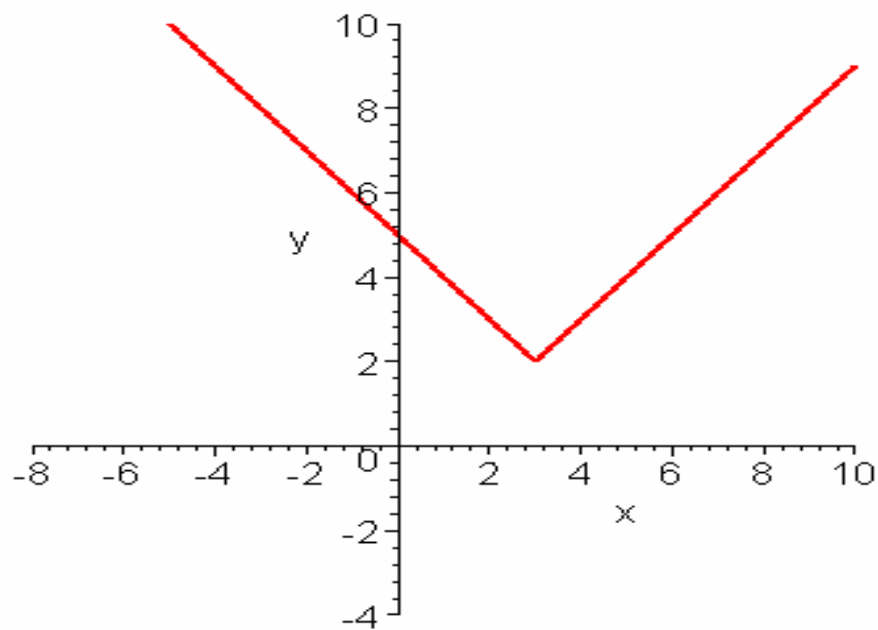


$$y = |x - 3| + 2$$

How will the  
graph look?

# Let's Graph

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



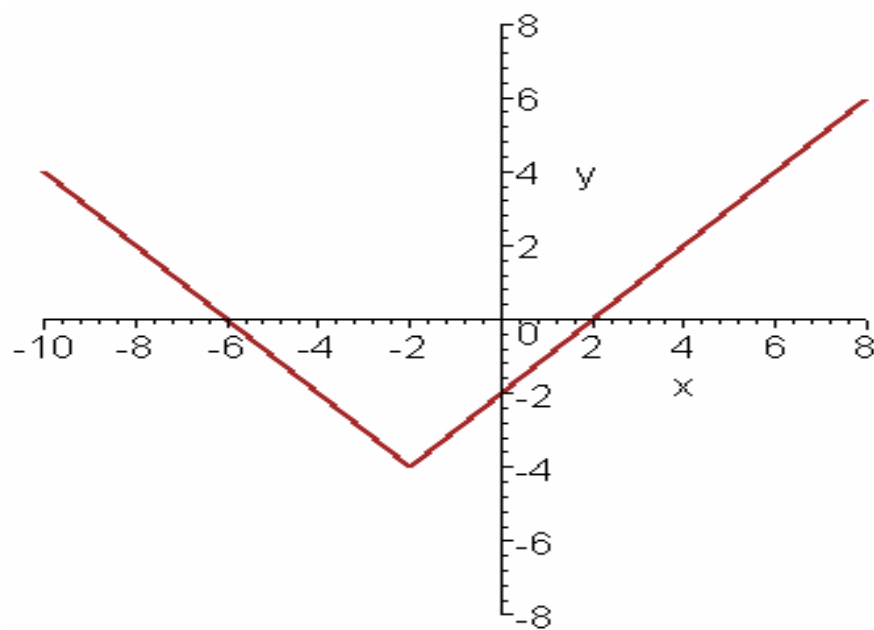


$$y = |x + 2| - 4$$

How will the  
graph look?

# Let's Graph

$$y = |x + 2| - 4$$

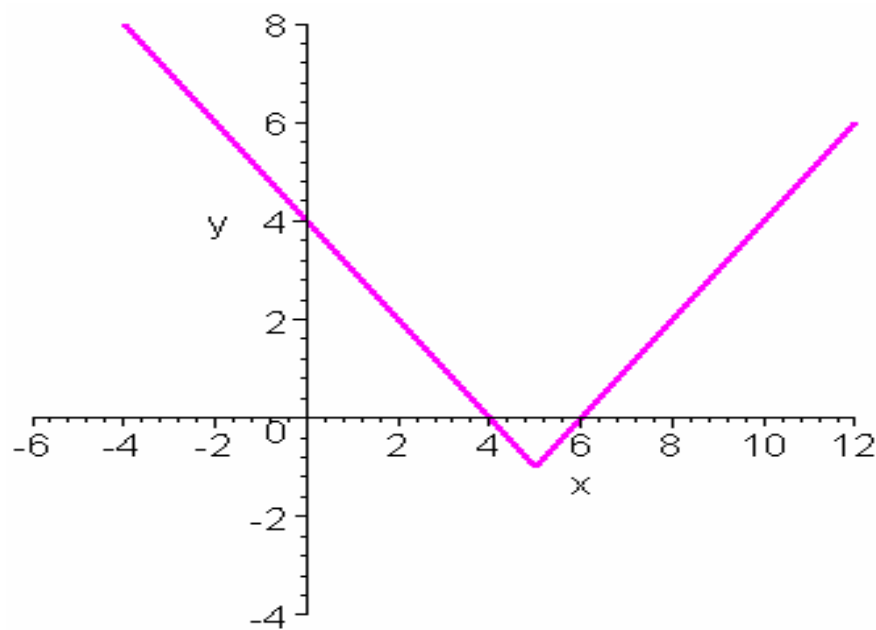


$$y = |x - 5| - 1$$

How will the  
graph look?

# Let's Graph

$$y = |x - 5| - 1$$



Given the following function,

$$y = c |x|$$

For this equation,  $c$  determines  
how wide or thin it will be.

if:  $|c| > 1$ , then the graph is closer to the y-axis

if:  $|c| = 1$ , then the graph remains the same

if:  $0 < |c| < 1$ , then the graph is further  
from the y-axis

if  $c$  is a negative number, then the graph  
will reflect on the x-axis

Given the following function,

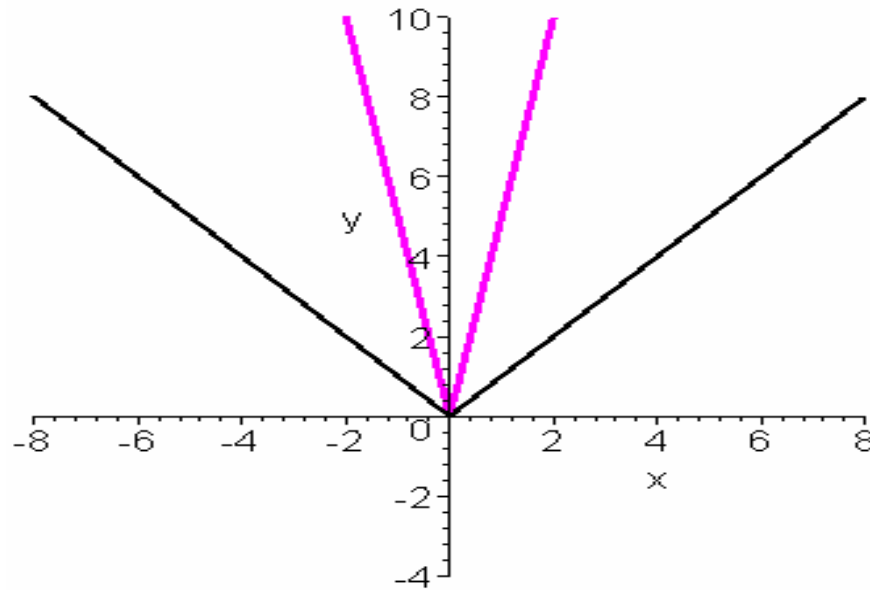
$$y = 5|x|$$

Since  $|5| > 0$ , then the graph is closer to the y-axis

# Let's Graph

$$y = |x|$$

$$y = 5|x|$$



$$y = 4|x|$$

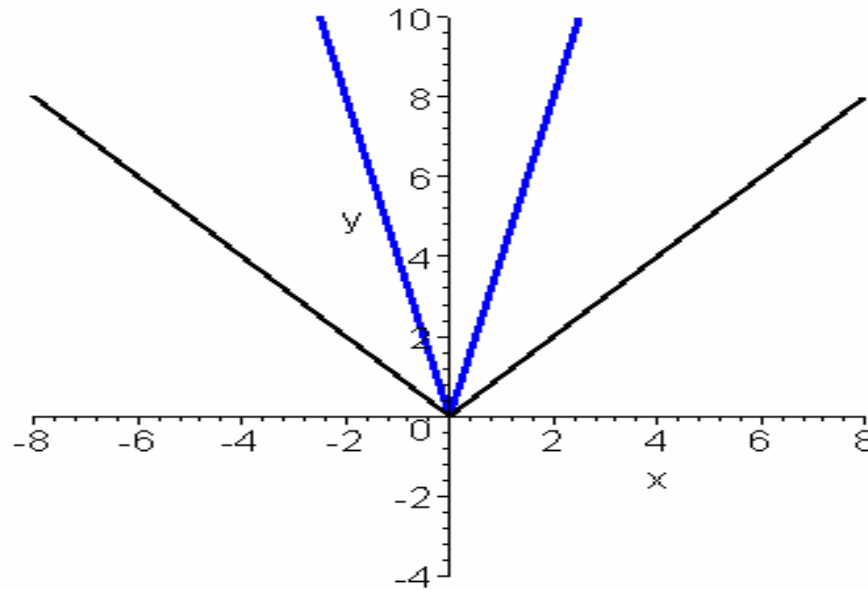
How will the  
graph look?



# Let's Graph

$$y = |x|$$

$$y = 4|x|$$



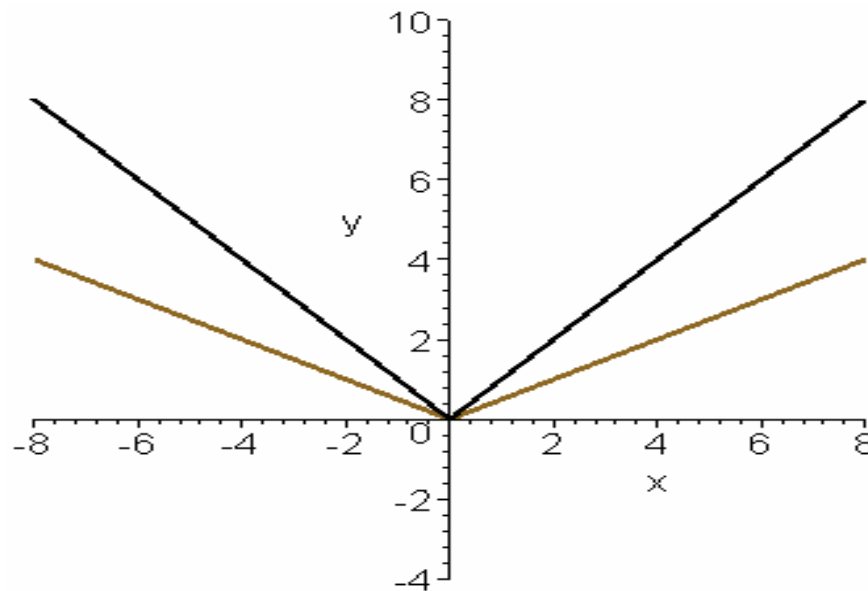
$$y = \frac{1}{2}|x|$$

How will the  
graph look?

# Let's Graph

$$y = |x|$$

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



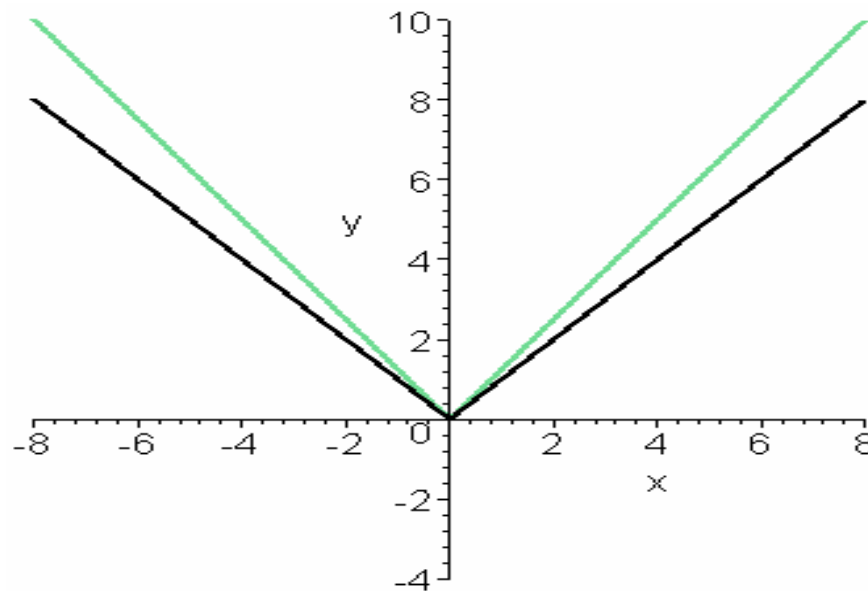
$$y = \frac{5}{4}|x|$$

How will the  
graph look?

# Let's Graph

$$y = |x|$$

$$y = \frac{5}{4}|x|$$



$$y = -\frac{2}{3}|x|$$

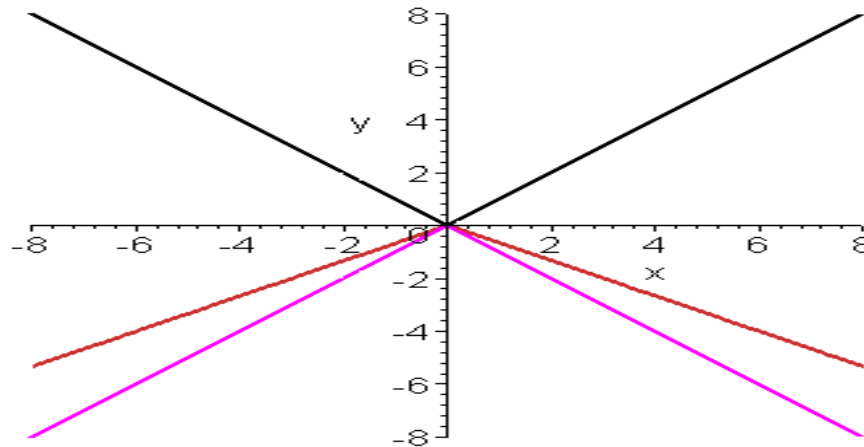
How will the  
graph look?

# Let's Graph

$$y = |x|$$

$$y = -|x|$$

$$y = -\frac{2}{3}|x|$$



Given the following function,

$$y = 5|x - 1| + 4$$

Since  $4 > 0$ , shift the graph “4” units up

$$x - 1 = 0$$

$$x = 1$$

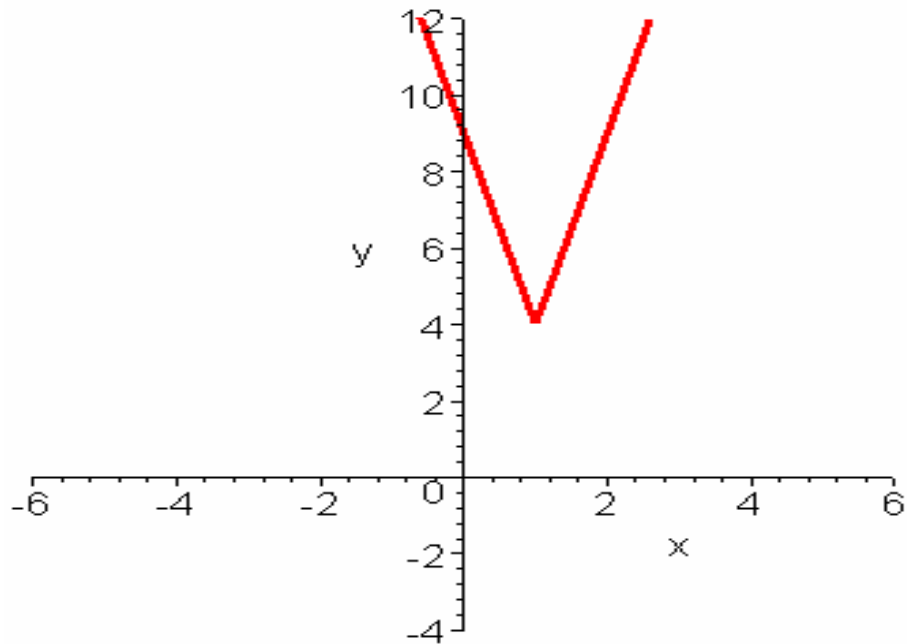
Since  $1 > 0$ , then shift the graph  
“1” unit to the right

Since  $|5| > 0$  shift the graph  
closer to the y-axis.



# Let's Graph

$$y = 5|x - 1| + 4$$

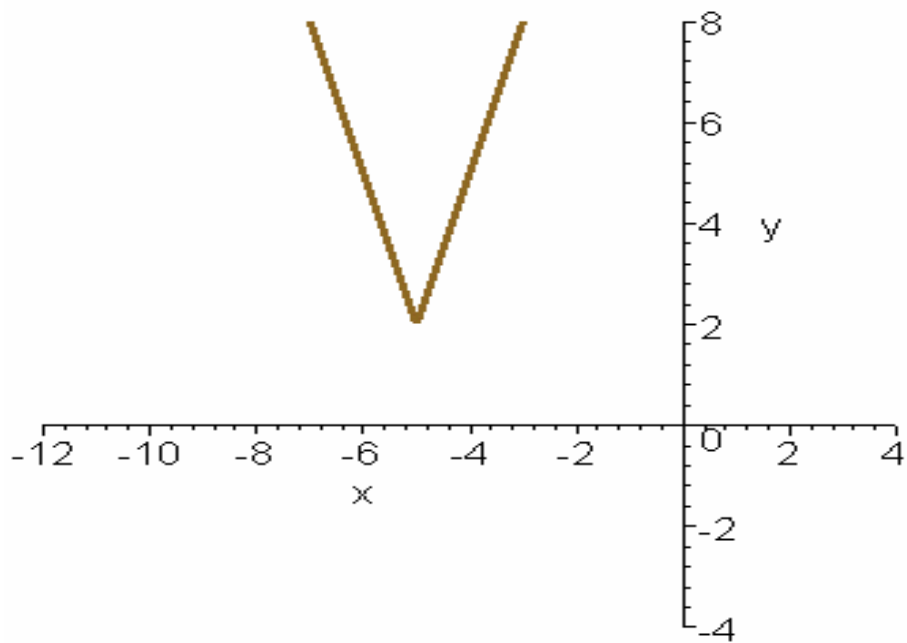


$$y = 3|x + 5| + 2$$

How will the  
graph look?

# Let's Graph

$$y = 3|x + 5| + 2$$

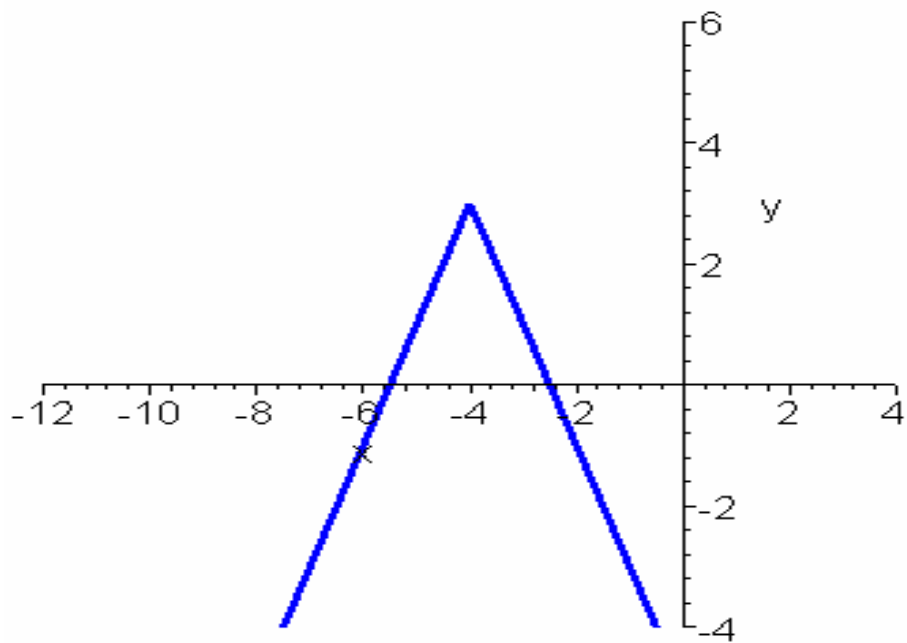


$$y = -2|x + 4| + 3$$

How will the  
graph look?

# Let's Graph

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

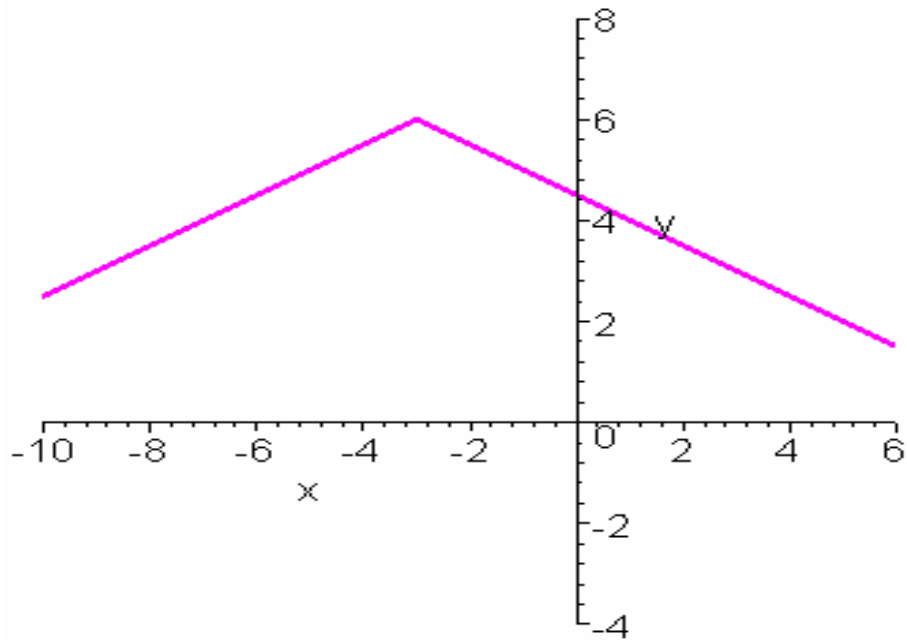


$$y = -\frac{1}{2}|x + 3| + 6$$

How will the  
graph look?

# Let's Graph

$$y = -\frac{1}{2}|x + 3| + 6$$



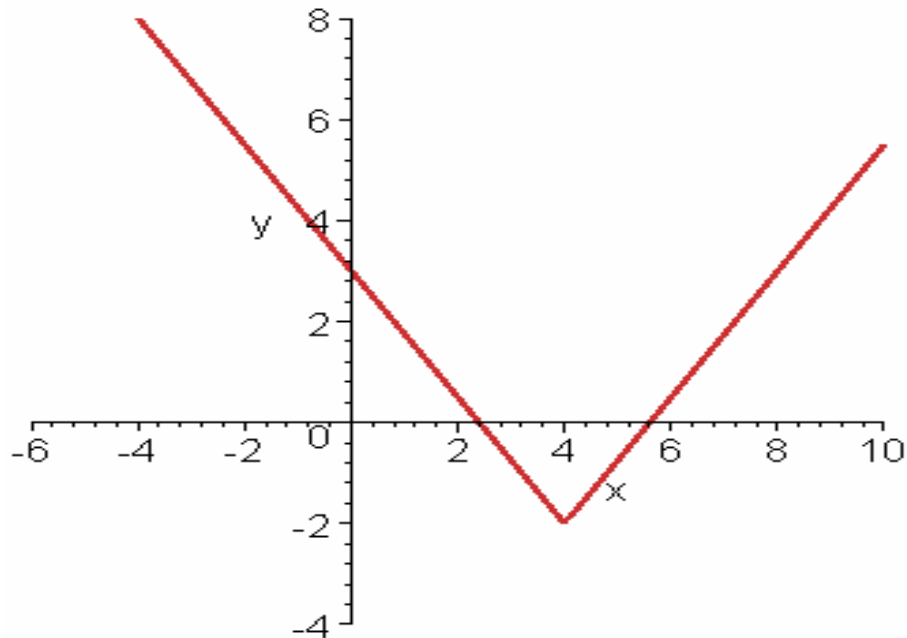
$$y = \frac{5}{4}|x - 4| - 2$$

How will the  
graph look?



# Let's Graph

$$y = \frac{5}{4}|x - 4| - 2$$

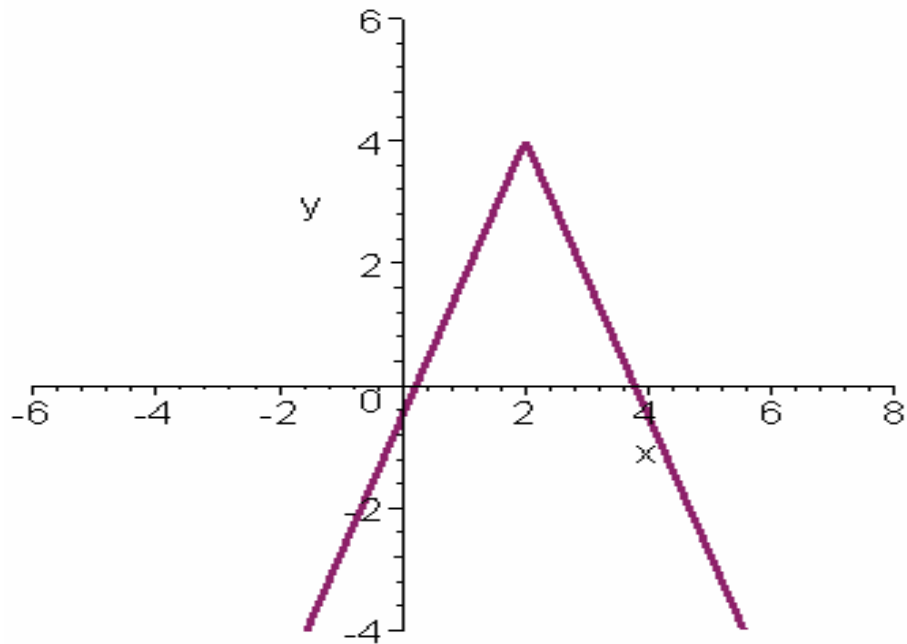


$$y = -\frac{9}{4}|x - 2| + 4$$

How will the  
graph look?

# Let's Graph

$$y = -\frac{9}{4}|x - 2| + 4$$

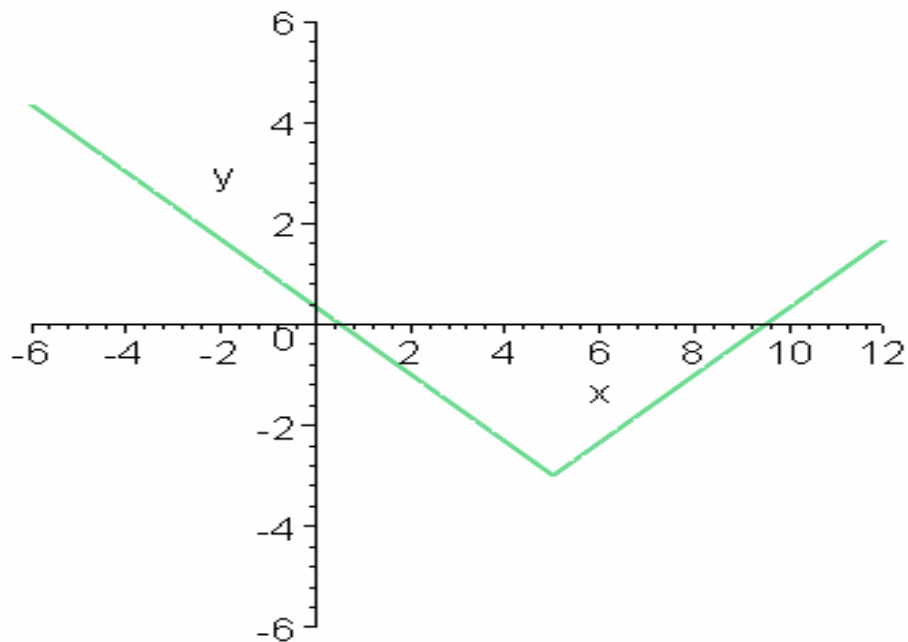


$$y = \frac{2}{3}|x - 5| - 3$$

How will the  
graph look?

# Let's Graph

$$y = \frac{2}{3}|x - 5| - 3$$

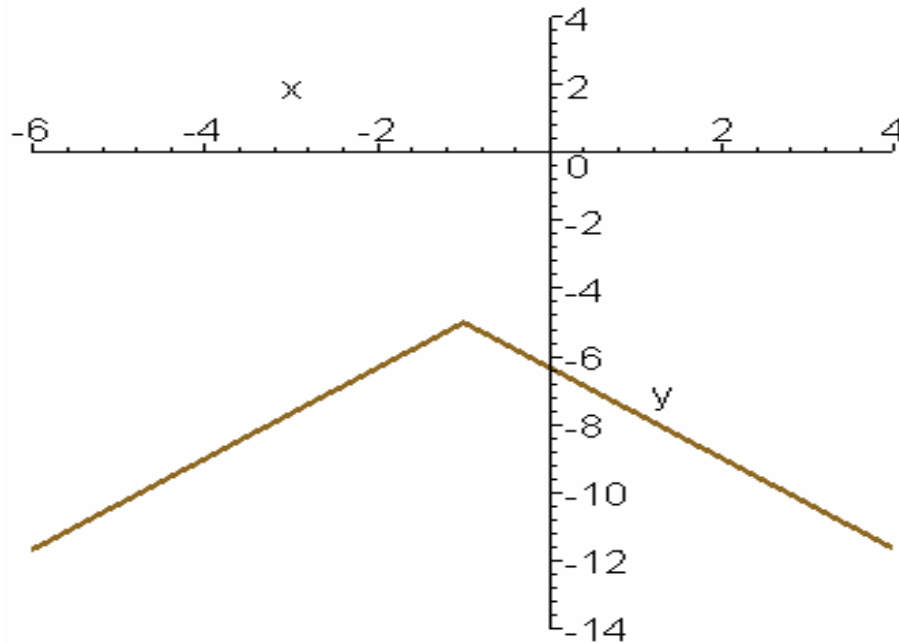


$$y = -\frac{4}{3}|x + 1| - 5$$

How will the  
graph look?

# Let's Graph

$$y = -\frac{4}{3}|x + 1| - 5$$



# Congratulations!!

You just completed the  
transformation of

$$y = |x|$$