

$y = -3x$   
 $x = \frac{4}{3}$

**Graphing Absolute Value Functions**

- 1) On this worksheet you will be studying **transformations** and **translations**. Write down a definition below for these two words.

**Transformations** - Changes graphs size, shape, position or orientation.

**Translations** - Shifts graph horizontally and/or vertically but does not change its size, shape, or orientation.

Pg 127

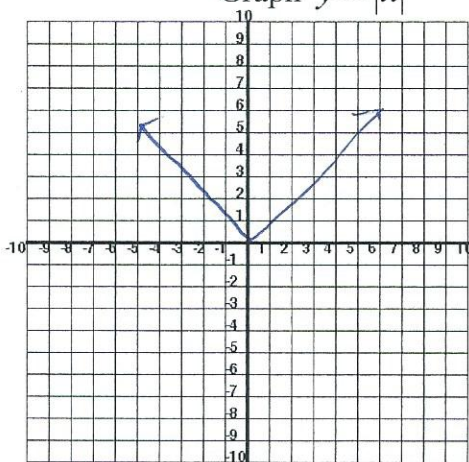
41-20E

30, 31, 36

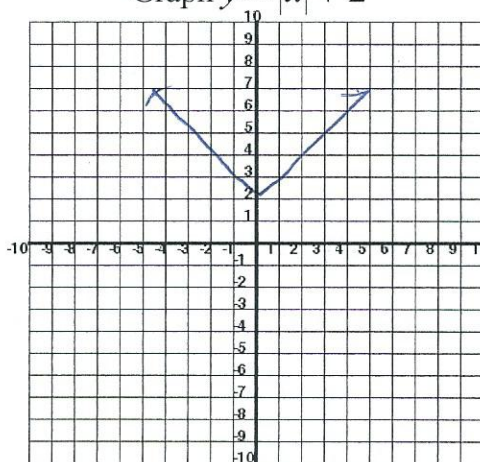
- 2) Complete the following table for the absolute value

| Input value | Output<br>$y =  x $ | Output<br>$y =  x  + 2$ | Output<br>$y =  x  - 3$ |
|-------------|---------------------|-------------------------|-------------------------|
| -3          | 3                   | 5                       | 0                       |
| -2          | 2                   | 4                       | -1                      |
| -1          | 1                   | 3                       | -2                      |
| 0           | 0                   | 2                       | -3                      |
| 1           | 1                   | 3                       | -2                      |
| 2           | 2                   | 4                       | -1                      |
| 3           | 3                   | 5                       | 0                       |

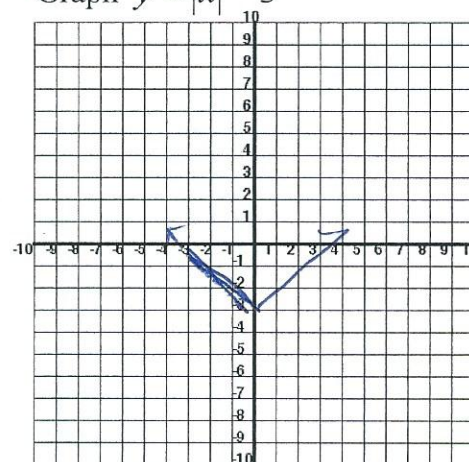
Graph  $y = |x|$



Graph  $y = |x| + 2$



Graph  $y = |x| - 3$



3) How did adding two outside of the absolute value function affect the graph?

Vertical translation up 2

How did subtracting 3 outside the absolute value function affect the graph?

Vertical translation down 3

Given any number  $c$  what will adding  $c$  outside of the absolute value sign do to the graph?

Vertical shift up  $c$

Given any number  $c$  what will subtracting it outside of the absolute value sign do to the graph?

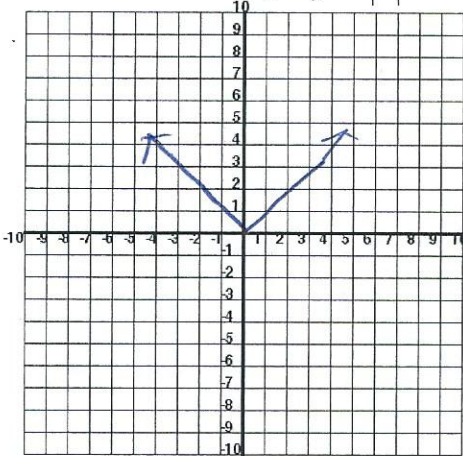
Vertical shift down  $c$

Is this a translation or a transformation?

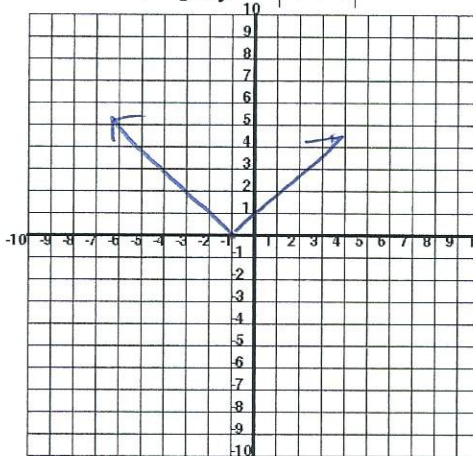
translation

4) Graph the functions below.

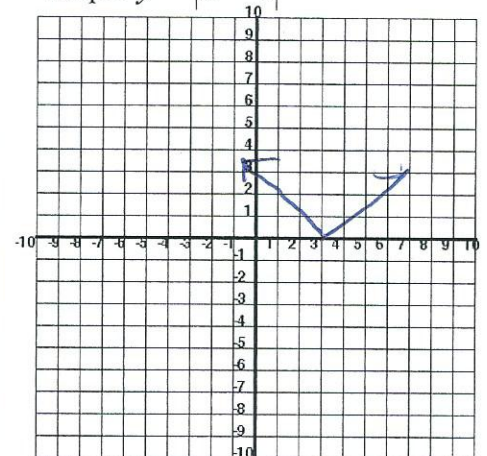
Graph  $y = |x|$



Graph  $y = |x + 1|$



Graph  $y = |x - 3|$



How did adding one inside of the absolute value function affect the graph?

horizontal translation left 1

How did subtracting 3 inside of the absolute value function affect the graph?

horizontal translation right 3

Given any number  $c$ , what will adding  $c$  inside of the absolute value sign do to the graph?

horizontal translation left  $c$

Given any number  $c$ , what will subtracting  $c$  inside of the absolute value sign do to the graph?

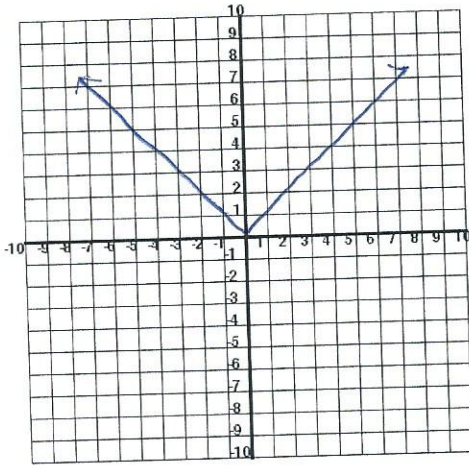
horizontal translation right  $c$

Is this a translation or a transformation?

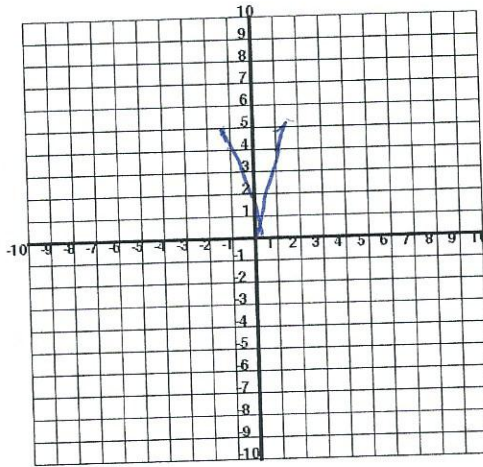
translation

1) Complete the following graphs and then answer the questions.

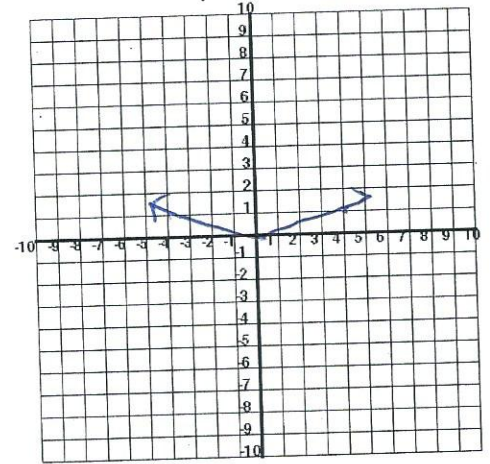
Graph  $y = |x|$



Graph  $y = 4 \cdot |x|$



Graph  $y = \frac{1}{4} \cdot |x|$



How did multiplying by 4 affect the graph?

*Vertical Stretch by a factor of 4*

What affect will multiplying by a number that is greater than one have on the graph?

*Vertical stretch which makes it skinnier/more narrow*

How did multiplying by  $\frac{1}{4}$  affect the graph?

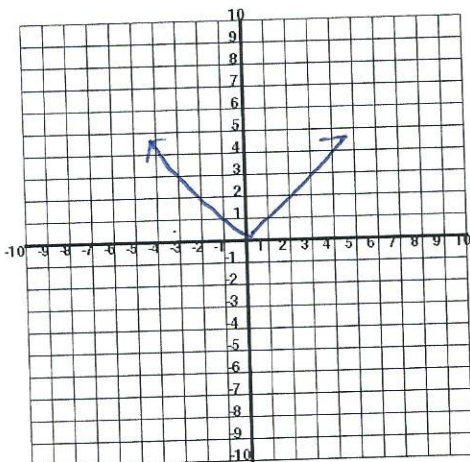
*Vertical shrink by a factor of 4*

What affect will multiplying by a number that is between zero and one have on the graph?

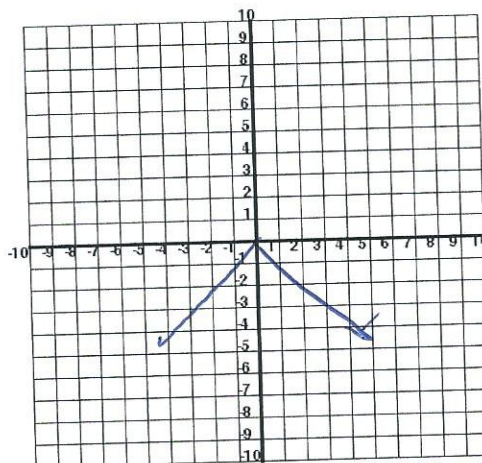
*Vertical shrink which makes it more wide/flatter*

2) Complete the following graphs and then answer the questions.

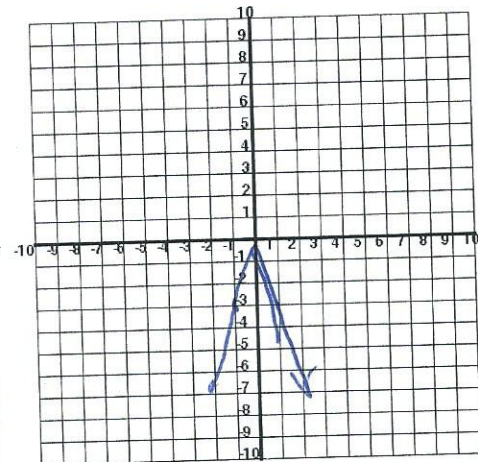
Graph  $y = |x|$



Graph  $y = -1 \cdot |x|$



Graph  $y = -3 \cdot |x|$



How did multiplying by a negative 1 affect the graph?

reflected over the x-axis

How did multiplying by a negative 3 affect the graph?

reflected it over the x-axis  
and a vertical stretch by a factor of 3

What do you think will happen any time there is a negative number outside of the absolute value function?

It will reflect over  
the x-axis

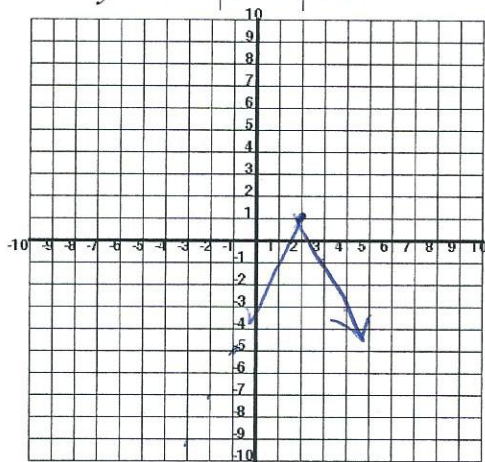
3) Using what you have learned predict how the graph of

$f(x) = -2 \cdot |x - 2| + 1$  will compare to the graph of  $y = |x|$

↑ reflect over x-axis  
↙ left  
↖ up 1

Complete the graph below to see if you are correct.

$y = -2 \cdot |x - 2| + 1$



| Input value | Output<br>$y = -2 \cdot  x - 2  + 1$ |
|-------------|--------------------------------------|
| -3          | -9                                   |
| -2          | -7                                   |
| -1          | -5                                   |
| 0           | -3                                   |
| 1           | -1                                   |
| 2           | 1                                    |
| 3           | -1                                   |

4) Write an equation that would give the graph below.

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

