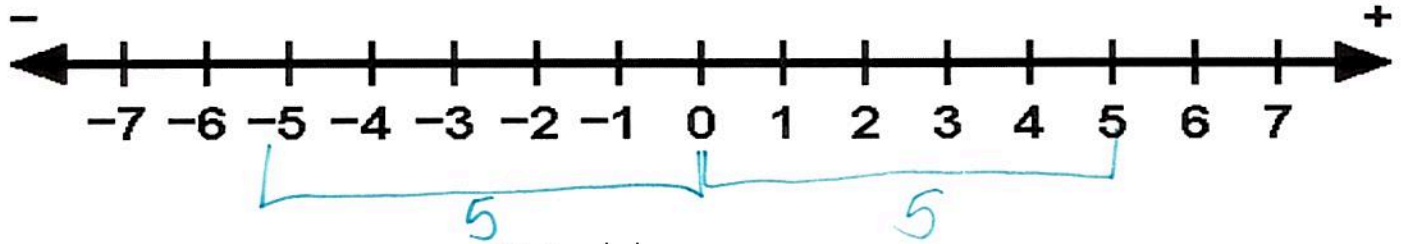


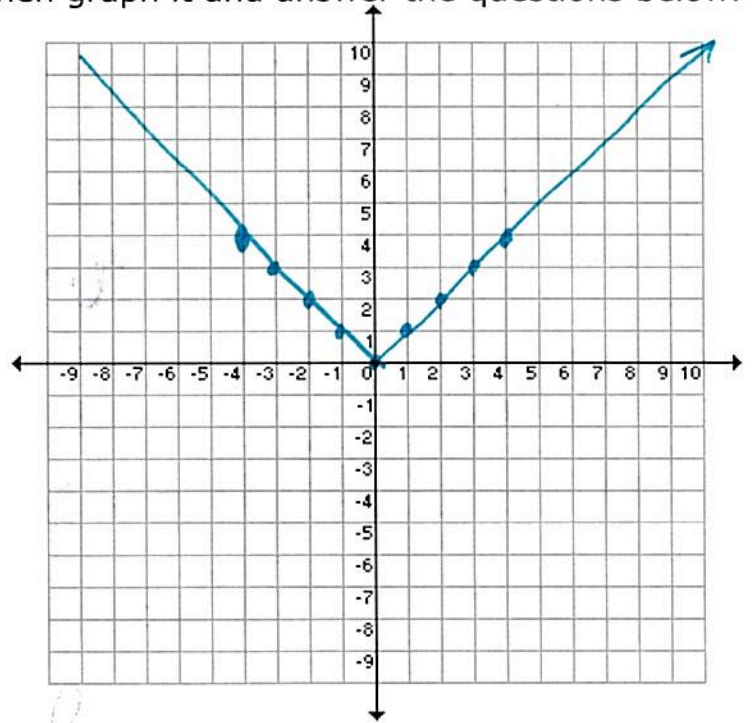
13.1 Absolute-Value Graphs & Transformations

Absolute Value: *The Distance away from zero.
& Always positive*



1. Make a table of values for $f(x) = |x|$. Then graph it and answer the questions below.

X	Y
-4	4
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3
4	4



Domain: \mathbb{R}

Range: $y \geq 0$

Axis of Symmetry: $x = 0$

Asymptote(s)?: ~~y = 0~~ None

Vertex: $0, 0$

Slope of the right side $+1$

Slope of the left side -1
left

*Slope
Indicates
Vertical
Stretch /
Compressor*

TRANSFORMATIONS:

$$y = f(x - C): \text{Right} \quad y = f(x) + D: \text{Up}$$

$$y = f(x + C): \text{Left} \quad y = f(x) - D: \text{Down}$$

$$y = Af(x): A > 1 \text{ Vertical Stretch}$$

$$0 < A < 1 \text{ Vertical Compression}$$

$$A < -1 \text{ Vertical Reflection (x-axis)}$$

$$y = f(Bx): B > 1 \text{ Horizontal Compression}$$

$$0 < B < 1 \text{ Horizontal Stretch}$$

$$B < -1 \text{ Horiz. Reflection (y-axis)}$$

$$y = Af(B(x \pm C)) \pm D$$

1. The function $f(x) = |x|$ has been transformed as shown in the picture.

a. Describe the transformation in words

Right 3 down 5

b. Describe the transformation using $f(x)$ notation.

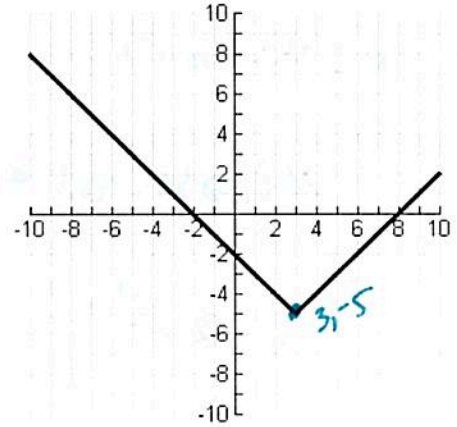
$$g(x) = f(x-3) - 5$$

c. Write the equation of the new function.

$$y = |x-3| - 5$$

d. If you moved the function in part c four units right and two units down, what would be the new equation?

$$y = |x-7| - 7$$



2. The function $f(x) = |x|$ has been transformed as shown in the picture.

e. Describe the transformation in words

-vert. flip
-left 4
-up 2

f. Describe the transformation using $f(x)$ notation.

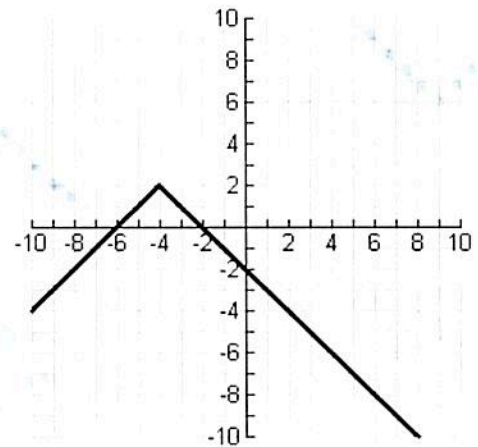
$$g(x) = -f(x+4) + 2$$

g. Write the equation of the new function.

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

h. If you moved the function in part g 4 units right and 2 units down, what would be the new equation?

$$y = -|x|$$



3. The function $f(x) = |x|$ has been transformed as shown in the picture.

i. Describe the transformation in words

vert stretch or vert stretch

"thru vert."

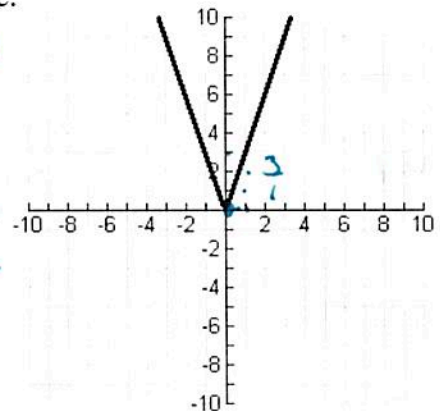
j. Describe the transformation using $f(x)$ notation.

$$g(x) = 3f(x)$$

const slope

k. Write the equation of the new function.

$$y = 3|x|$$



4. The function $f(x) = |x|$ has been transformed as shown in the picture.

l. Describe the transformation in words

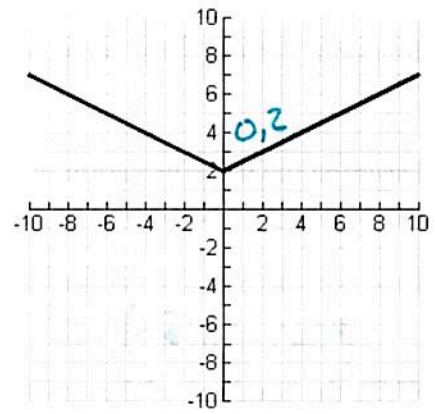
up 2 v-compression

m. Describe the transformation using $f(x)$ notation.

~~$f(x) \rightarrow$~~ $\frac{1}{2}f(x) + 2$

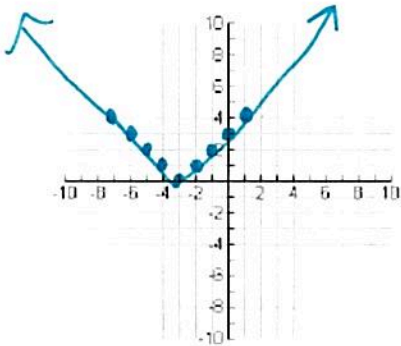
n. Write the equation of the new function.

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



5. Given the equation of the absolute value function, graph and identify the following attributes.

o. $g(x) = |-(x+3)|$



Transformations:

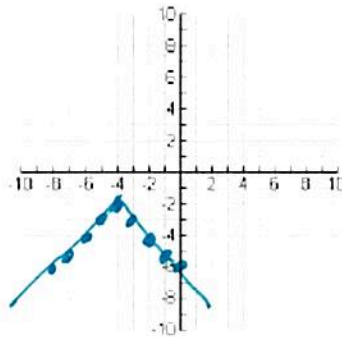
horiz. flip
left 3

Vertex:

$$(-3, 0)$$

Range: $y \geq 0$

p. $g(x) = -|x+4| - 2$



Transformations:

vert. flip
left 4
down 2

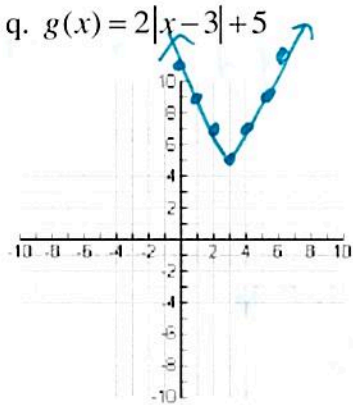
Vertex:

$$-4, -2$$

Range:

$$y \leq -2$$

q. $g(x) = 2|x-3| + 5$



Transformations:

vert. compress stretch
right 3 up 5

Vertex:

$$(3, 5)$$

Range:

$$y \geq 5$$

6. Given the following equations, identify the transformations, vertex and range.

r. $y = |2(x+1)|$

Transformations:

horiz. comp.
left 1

Vertex:

$$(-1, 0)$$

Range:

$$y \geq 0$$

s. $y = \left|\frac{1}{2}x\right| - 5$

Transformations:

horiz. stretch
down 5

Vertex:

$$(0, -5)$$

Range:

$$y \geq -5$$

t. $y = |-3(x+2)| + 4$

Transformations:

horiz. flip + compression
left 2
up 4

Vertex:

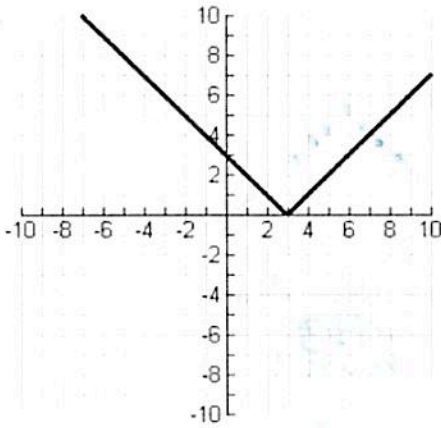
$$(-2, 4)$$

Range:

$$y \geq 4$$

For the following, state the vertex and transformations, and write the equation of the transformed absolute value function.

1.

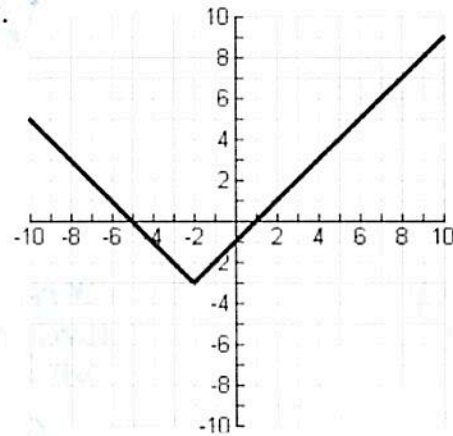


Vertex: $(3, 0)$

Trans: $y = |x - 3|$ ←

Equation: Right 3 ←

2.

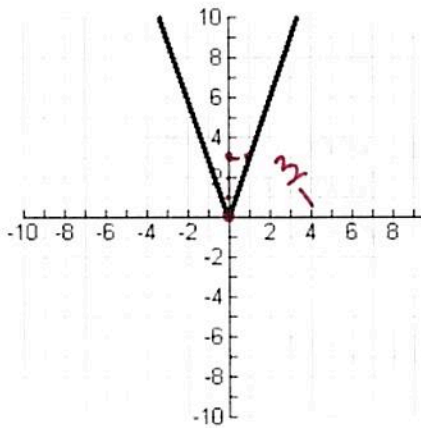


Vertex: $(-2, -3)$

Trans: left 2, Down 3

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

3.

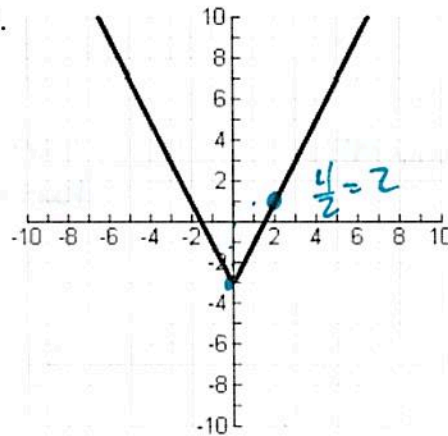


Vertex: $(0, 0)$

Trans: vert. stretch

Equation: $y = 3|x|$

4.



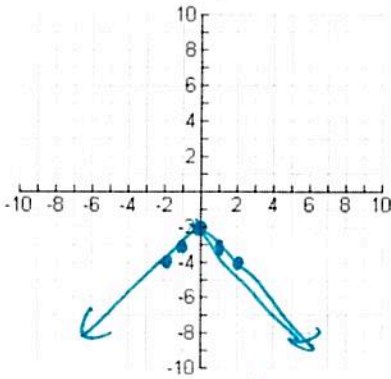
Vertex: $(0, -3)$

Trans: Down 3; V. stretch

Equation: $y = 2|x| - 3$

Given the equation of the absolute value function, graph and identify the following attributes.

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

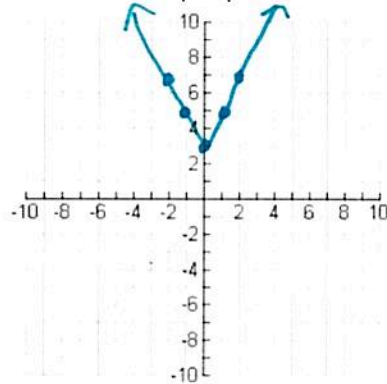


Trans: Vert. Flip
Down 2

Vertex: $(0, -2)$

Range: $y \leq -2$

6. $f(x) = 2|-x| + 3$

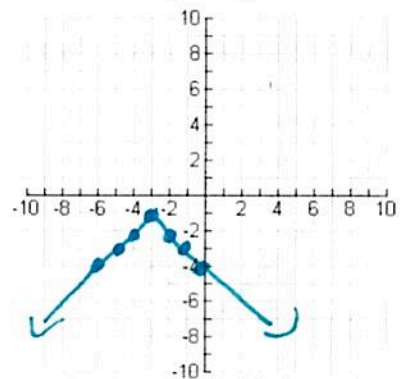


Trans: Vert. Stretch
horiz. Flip
up 3

Vertex: $(0, 3)$

Range: $y \geq 3$

7. $f(x) = -|x+3| - 1$



Trans: Vert. Flip
Left 3
Down 1

Vertex: $(-3, -1)$

Range: $y \leq -1$

Given the following equations, identify the transformations, vertex and range.

8. $y = |4(x-1)| + 1$

Trans: horiz. compression
Right 1
Up 1

Vertex: $(1, 1)$

Range: $y \geq 1$
 $[0, \infty)$

9. $y = -\left|\frac{1}{5}x\right| - 1$

Trans: Vert. Flip
horiz. stretch
Down 1

Vertex: $(0, -1)$

Range: $y \leq -1$
 $(-\infty, -1]$

10. $y = 3|-(x+2)|$

Trans: Vert. Stretch
horiz. flip
left 2

Vertex: $(-2, 0)$

Range: $y \geq 0$
 $[0, \infty)$