

Name: Key Date: \_\_\_\_\_

### Absolute Value Transformations

$$f(x) = a|x-h| + k$$

- a: Vertical Stretch/Shrink
- h: Left/Right Vertex: (h, k)
- k: Up/Down

Describe the transformations:

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

Left 1  
Down 3

3.  $f(x) = 2|x-1| - 6$

V Stretch of 2  
Right 1, Down 6

2.  $f(x) = -|x| + 4$

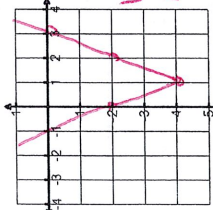
Reflect over x-axis  
up 4

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

V Shrink of 1/3  
Left 2, Up 3

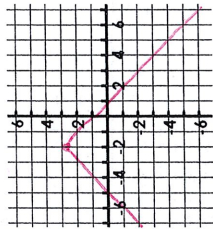
Graph the following absolute value functions using transformations

5.  $f(x) = 2|x-1| - 4$



Vertex (1, -4)

Transformations:  
V Stretch of 2  
Right 1  
Down 4

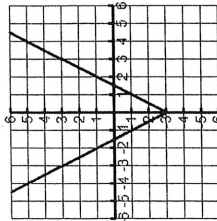


Vertex (-2, 3)

Transformations:  
Reflect over x-axis  
Left 2  
Up 3

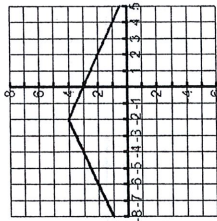
Write the equation of the absolute value given the graph.

7.  $f(x) = 2|x+1| - 3$



Vertex (-1, -3)

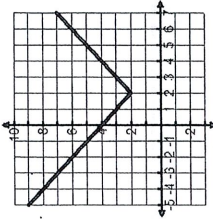
a: 2



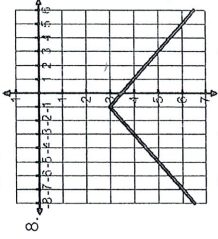
Vertex (-2, 4)

a: -1/2

You try! Write the equation of the absolute value given the graph.



7.  $f(x) = 1x - 2| + 2$



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

Solving Absolute Value Equations:  $|ax+b|=c$ , where  $c > 0$

- Isolate the absolute value, then split into 2 equations:  $ax+b=c$  or  $ax+b=-c$
- ALWAYS check for extraneous solutions!

9. Solve for x:  $|x-3|=6$

$x-3=6$       $x-3=-6$   
 $x=9$       $x=-3$

$x=9, -3$

10. Solve for x:  $|6x-3|=15$

$6x-3=15$       $6x-3=-15$   
 $6x=18$       $6x=-12$   
 $x=3$       $x=-2$

$x=3, -2$

11. Solve for x:  $|2x+7|-3=8$

$2x+7=11$       $2x+7=-11$   
 $2x=4$       $2x=-18$   
 $x=2$       $x=-9$

$x=2, -9$

12. Solve for x:  $|2x-5|=9$

$2x-5=9$       $2x-5=-9$   
 $2x=14$       $2x=-4$   
 $x=7$       $x=-2$

$x=7, -2$

13. Solve for x:  $|2x+5|=11$

$2x+5=11$       $2x+5=-11$   
 $2x=6$       $2x=-16$   
 $x=3$       $x=-8$

$x=3, -8$

14. Solve for x:  $|4x+10|=6x$

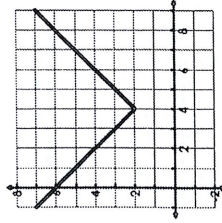
$4x+10=6x$       $4x+10=-6x$   
 $10=2x$       $10=-10x$   
 $5=x$       $-1x$

$x=5$

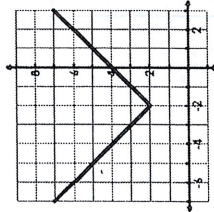
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Write the equation for the absolute value graphs.

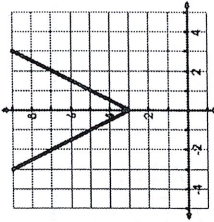
1.  $f(x) = |x-4|+2$



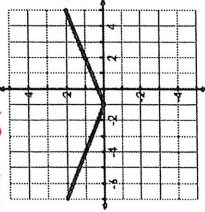
2.  $f(x) = |x+2|+2$



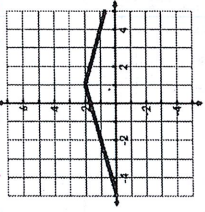
3.  $f(x) = 2|x|+3$



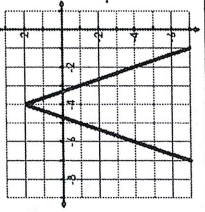
4.  $f(x) = \frac{1}{3}|x+1|$



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



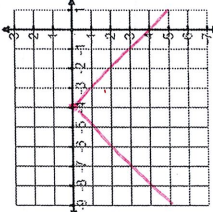
6.  $f(x) = -3|x+4|+2$



Graph the absolute value function. State the vertex and a value.

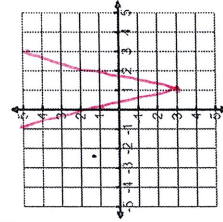
7.  $f(x) = -|x+4|$

Vertex: (-4, 0)



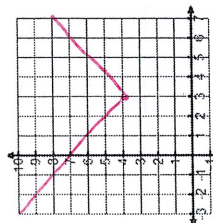
8.  $f(x) = 4|x-1|-3$

Vertex: (1, -3)



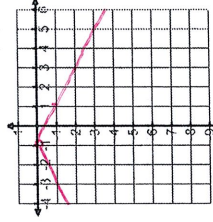
9.  $f(x) = |x-3|+4$

Vertex: (3, 4)



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

Vertex: (-1, 0)



Describe the transformations.

11.  $f(x) = -3|x|$

Reflect over x-axis  
V-stretch of 3

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

Left 2  
Down 3

14.  $f(x) = |-x-2|+1$

Reflect over y-axis  
LEFT 2, UP 1

15.  $f(x) = \frac{1}{3}|x-3|-4$

Reflect over x-axis,  
V-stretch of 1/3  
Right 3, Down 4

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

Reflect over x-axis  
Left 2, Up 5

16.  $f(x) = 3|x+2|-1$

V-stretch of 3  
Left 2, Down 1

Solve the following equations for x.

17.  $-2|x| = -4$

$|x| = 2$

$x = 2, -2$

18.  $|x-4| - 5 = 1$

$|x-4| = 6$

$x-4 = 6 \quad x-4 = -6$   
 $x = 10 \quad x = -2$

$x = 10, -2$

19.  $-\frac{1}{3}|x-2|+1 = 10$

$-\frac{1}{3}|x-2| = 9$

$|x-2| = -27$

No Solution

20.  $2|x+1|+1 = 1$

$2|x+1| = 0$

$|x+1| = 0$

$x = -1$

21.  $-3|x+5|+2 = 5$

$-3|x+5| = 3$

$|x+5| = -1$

No Solution

22.  $|x+3| = 7x$

$x+3 = 7x \quad x+3 = -7x$

$3 = 6x \quad 3 = -8x$

$\frac{1}{2} = x \quad -\frac{3}{8} = x$

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

23.  $f(x) = \begin{cases} 2x^2, & x < 2 \\ |x-4|, & x \geq 2 \end{cases}$

Domain:  $\mathbb{R}$

Range:  $[0, \infty)$

Pt. of Discontinuity:  $x = 2$

Increasing:  $(0, 2) \cup (4, \infty)$

