

Day 61

Warm-Ups

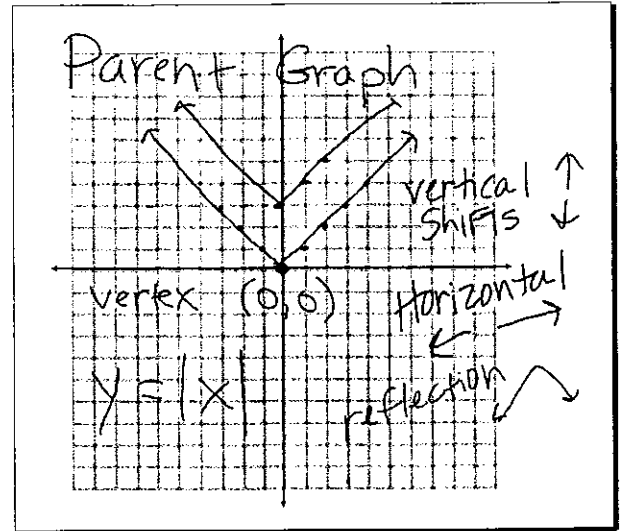
Solve for y.

①  $x + y = 3$   
 $-x \quad -x$   
 $y = -x + 3$

②  $3x - 2y = 6$   
 $-3x \quad -3x$   
 $-2y = 6$   
 $y = -3$

③ Find the slope:  $(4, 3)$   $(-6, 3)$

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 3}{-6 - 4} = \frac{0}{-10} = 0$   
 Undefined



examples:

①  $y = |x| + 3$  vertex:  $(0, 3)$   
 vertical shift (up 3)

②  $y = |x - 2|$  vertex:  $(2, 0)$   
 horizontal shift right 2

③  $y = |x| - 4$  vertex:  $(0, -4)$   
 vertical shift, down 4

④  $y = |x + 5|$  v:  $(-5, 0)$   
 horizontal shift, left 5

⑤  $y = |x + 3| + 9$   
 H.S. left 3 up 9  
 vertex:  $(-3, 9)$

⑥  $y = |x - 3| - 2$   
 right 3 (H.S.) v.s. down 2

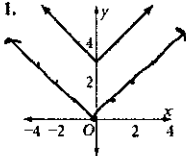
vertex  $(3, -2)$

⑦  $y = -|x + 4|$   $x + 4 = 0$   
 $x = -4$   
 reflection (opens down) H.S. left 4  
 vertex  $(-4, 0)$

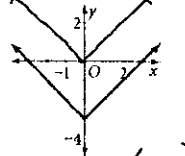
⑧  $y = -|x - 6|$   
 reflection vertex:  $(6, 0)$   
 H.S. right 6

Parent Graph P.361

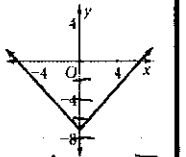
Describe how each graph is like the graph of  $y = |x|$  and how it is different.

1. 

up 3 (v.s.)  
vertical  
 $y = |x| + 3$

2. 

down 3 (v.s.)  
 $y = |x| - 3$

3. 

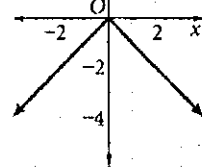
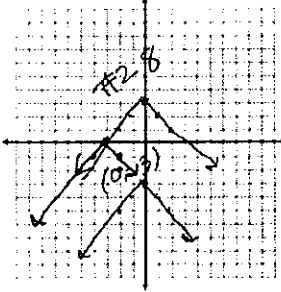
down (v.s.) 7  
 $y = |x| - 7$

At the right is the graph of  $y = -|x|$ .  
Graph each function by translating  $y = -|x|$ .

28.  $y = -|x| + 3$  (0,3) 29.  $y = -|x| - 3$

30.  $y = -(x + 3)$  31.  $y = -|x - 3|$

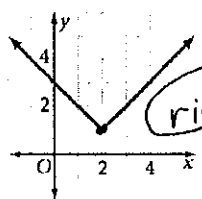
H.S. none  
V.S. left 3  
refl. yes

36. The graph at the right shows a translation of  $y = |x|$  where there is both a vertical and a horizontal change. Which equation below is an equation for this graph?

A.  $y = |x + 2| - 1$   
 B.  $y = |x - 2| + 1$   
 C.  $y = |x - 2| - 1$   
 D.  $y = |x + 2| + 1$

$x - 2 = 0$   
 $x - 2$   
 $x - 2$

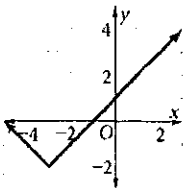


right 2  
up 1  
outside

Graph each translation of  $y = |x|$ .

Sample For  $y = |x + 3| - 2$ , add 3 indicates the translation of the graph 3 units left. Subtract 2 indicates the translation of the graph 2 units down.

37.  $y = |x - 1| + 2$       38.  $y = |x + 2| - 1$   
 39.  $y = |x - 3| - 4$       40.  $y = |x + 3| + 4$



41. a. Graph  $y = |x - 2| + 3$ . (*Hint:* Read the sample above for Exercises 37–40.)

b. The vertex of an absolute value function is the point at which the function changes direction. What is the vertex of  $y = |x - 2| + 3$ ?

c. What relationship do you see between the vertex and the equation?

d. **Writing** Explain how you would graph any equation of the form  $y = |x - a| + b$ .

44. Which equation translates  $y = |x|$  by 8 units to the left?

A.  $y = |x| + 8$     B.  $y = |x + 8|$     C.  $y = |x| - 8$     D.  $y = |x - 8|$

45. What is the lowest point of the graph of  $y = |x - 9|$ ?

F. (0, -9)    G. (-9, 0)    H. (9, 0)    J. (0, 9)

46. What point do the graphs of  $y = |x - 3|$  and  $y = |x + 5|$  have in common?

A. (-1, 4)    B. (1, 4)    C. (4, 1)    D. (4, -1)

47. The graph of which equation contains the point (3, 5)?

F.  $y = |x + 3| + 5$     G.  $y = |x - 3| + 5$

H.  $y = |x + 3| - 5$     J.  $y = |x - 3| - 5$