

## Worksheet: Piecewise Functions

Evaluate the function for the given value of  $x$ .

$$f(x) = \begin{cases} 3, & \text{if } x \leq 0 \\ 2, & \text{if } x > 0 \end{cases}$$

$$g(x) = \begin{cases} x + 5, & \text{if } x \leq 3 \\ 2x - 1, & \text{if } x > 3 \end{cases}$$

$$h(x) = \begin{cases} \frac{1}{2}x - 4, & \text{if } x \leq -2 \\ 3 - 2x, & \text{if } x > -2 \end{cases}$$

1.  $f(2) = 2$

2.  $f(-4) = 3$

3.  $f(0) = 3$

4.  $f\left(\frac{1}{2}\right) = 2$

5.  $g(7) = 13$

6.  $g(0) = 5$

7.  $g(-1) = 4$

8.  $g(3) = 8$

9.  $h(-4) = -6$

10.  $h(-2) = -5$

11.  $h(-1) = 5$

12.  $h(6) = -9$

Match the piecewise function with its graph.

13.  $f(x) = \begin{cases} x - 4, & \text{if } x \leq 1 \\ 3x, & \text{if } x > 1 \end{cases}$  **E.**

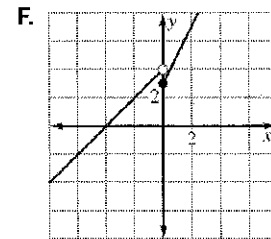
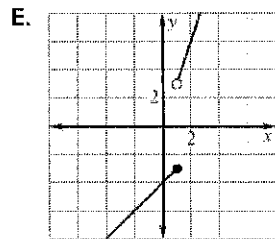
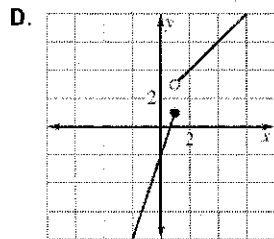
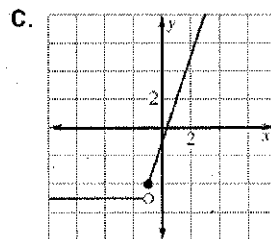
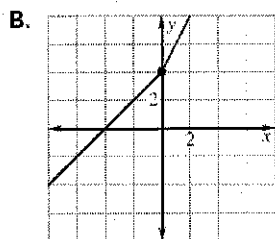
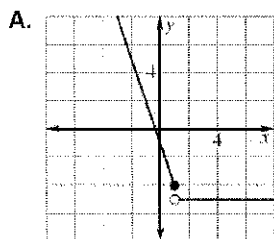
14.  $f(x) = \begin{cases} x + 4, & \text{if } x \leq 0 \\ 2x + 4, & \text{if } x > 0 \end{cases}$  **B.**

15.  $f(x) = \begin{cases} 3x - 2, & \text{if } x \leq 1 \\ x + 2, & \text{if } x > 1 \end{cases}$  **D.**

16.  $f(x) = \begin{cases} 2x + 3, & \text{if } x \geq 0 \\ x + 4, & \text{if } x < 0 \end{cases}$  **F.**

17.  $f(x) = \begin{cases} 3x - 1, & \text{if } x \geq -1 \\ -5, & \text{if } x < -1 \end{cases}$  **A.**

18.  $f(x) = \begin{cases} -3x - 1, & \text{if } x \leq 1 \\ -5, & \text{if } x > 1 \end{cases}$  **A.**



Graph the function.

19.

$$f(x) = \begin{cases} x + 3, & \text{if } x \leq 0 \\ 2x, & \text{if } x > 0 \end{cases}$$

20.

$$f(x) = \begin{cases} x + 1, & \text{if } x < 0 \\ -x + 1, & \text{if } 0 \leq x \leq 2 \\ x - 1, & \text{if } x > 2 \end{cases}$$

21.

$$f(x) = \begin{cases} 2, & \text{if } x \leq -3 \\ -1, & \text{if } -3 < x < 3 \\ 3, & \text{if } x \geq 3 \end{cases}$$

22. The admission rates at an amusement park are as follows.

Children 5 years old and under: free

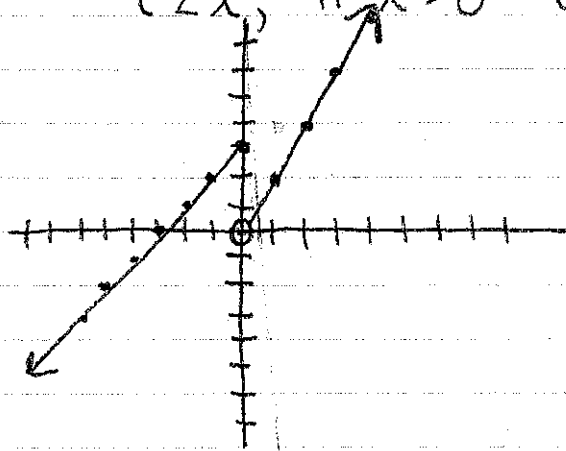
Children between 5 years and 12 years, inclusive: \$10.00

Children between 12 years and 18 years, inclusive: \$25.00

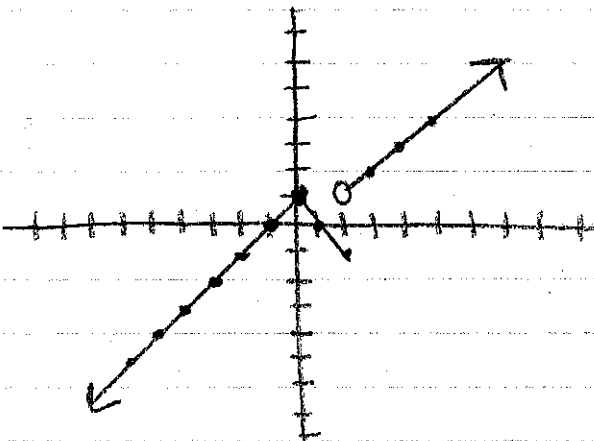
Adults: \$35.00

- Write a piecewise function that gives the admission price for a given age.
- Graph the function.

$$19. f(x) = \begin{cases} x+3, & \text{if } x \leq 0 & (0, 3) & \text{not} \\ 2x, & \text{if } x > 0 & (0, 0) & \text{continuous} \end{cases}$$

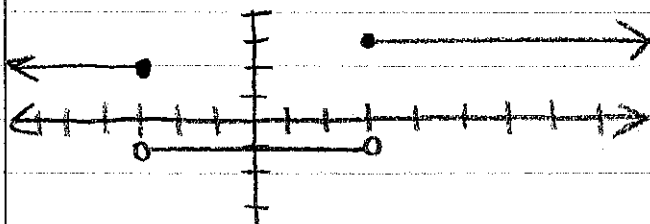


$$20. f(x) = \begin{cases} x+1, & \text{if } x < 0 & (0, 1) & \text{not} \\ -x+1, & \text{if } 0 \leq x \leq 2 & (0, 1) & (2, -1) & \text{cont.} \\ x-1, & \text{if } x > 2 & (2, 1) & \end{cases}$$



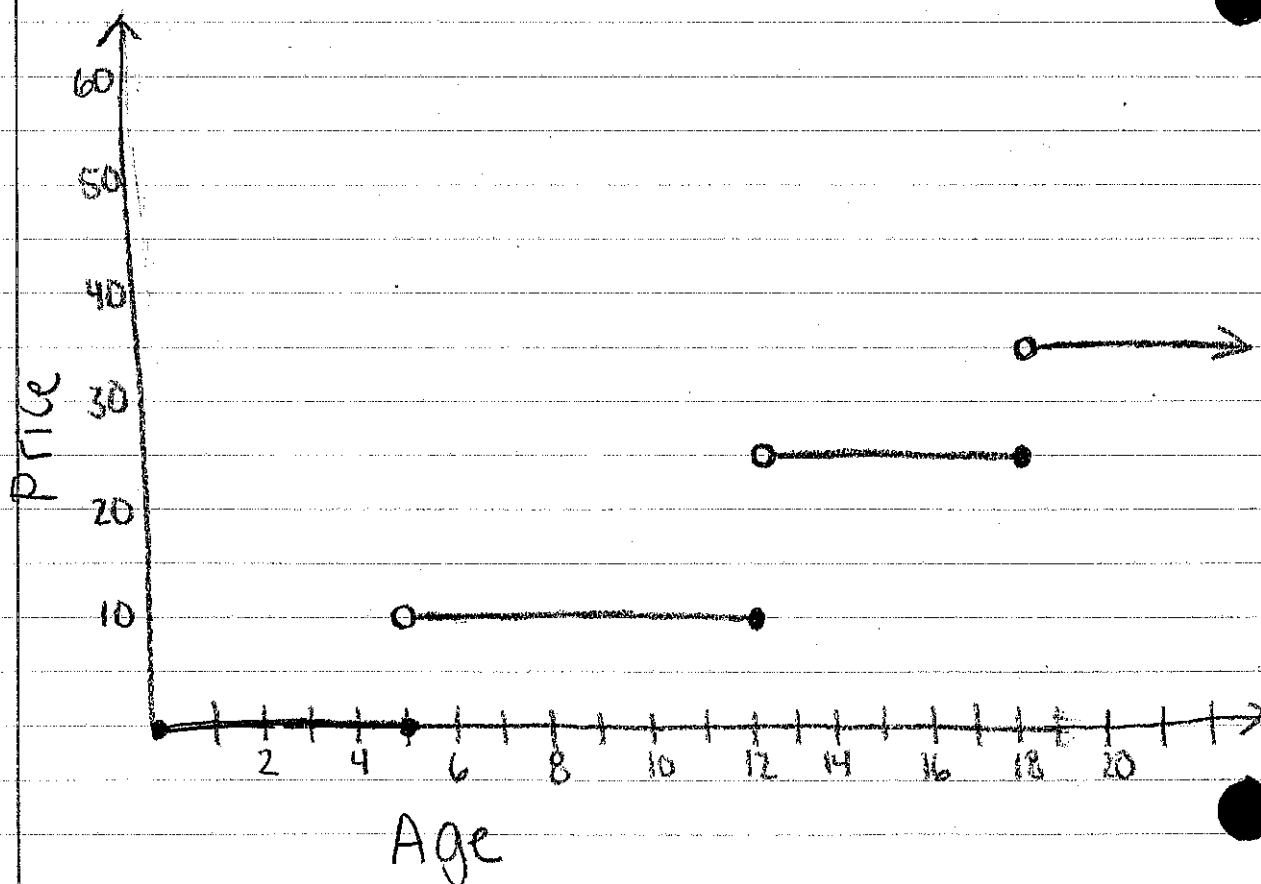
21.

$$f(x) = \begin{cases} 2, & \text{if } x \leq -3 \\ -1, & \text{if } -3 < x < 3 \\ 3, & \text{if } x \geq 3 \end{cases}$$



22.

$$f(x) = \begin{cases} 0, & \text{if } 0 \leq x \leq 5 \\ 10, & \text{if } 5 < x \leq 12 \\ 25, & \text{if } 12 < x \leq 18 \\ 35, & \text{if } x > 18 \end{cases}$$



For each of the absolute value equations below, rewrite as a piecewise function.

1.  $f(x) = |x-6|+7$   
 $m=1$  (6, 7)

left  
 $y-7=1(x-6)$   
 $y=-x+6+7$   
 $=-x+13$

right  
 $y-7=1(x-6)$   
 $y=1x-6+7$   
 $y=x+1$

$$f(x) = \begin{cases} -x+13 & \text{if } x < 6 \\ x+1 & \text{if } x \geq 6 \end{cases}$$

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

left  
 $y+1=1(x+2)$   
 $y=x+2-1$   
 $y=x+1$

right  
 $y+1=-1(x+2)$   
 $y=-x-2-1$   
 $y=-x-3$

$$f(x) = \begin{cases} x+1 & \text{if } x < -2 \\ -x-3 & \text{if } x \geq -2 \end{cases}$$

3.  $f(x) = 2|x-3|$   
 $m=2$   
(3, 0)

left  
 $y=-2(x-3)$   
 $y=-2x+6$

right  
 $y=2(x-3)$   
 $y=2x-6$

$$f(x) = \begin{cases} -2x+6 & \text{if } x < 3 \\ 2x-6 & \text{if } x \geq 3 \end{cases}$$

4.  $f(x) = \frac{2}{3}|x-6|+3$   
 $m = \frac{2}{3}$  (6, 3)

left  
 $y-3 = \frac{2}{3}(x-6)$   
 $y = -\frac{2}{3}x + 4 + 3$   
 $y = -\frac{2}{3}x + 7$

right  
 $y-3 = \frac{2}{3}(x-6)$   
 $y = \frac{2}{3}x - 4 + 3$   
 $y = \frac{2}{3}x - 1$

$$f(x) = \begin{cases} -\frac{2}{3}x+7 & \text{if } x < 6 \\ \frac{2}{3}x-1 & \text{if } x \geq 6 \end{cases}$$

5.  $f(x) = -|2x-10|+1$   
 $m = -1 \cdot |2| = -2$   
(5, 1)

left  
 $y-1=2(x-5)$   
 $y=2x-10+1$   
 $y=2x-9$

right  
 $y-1=-2(x-5)$   
 $y=-2x+10+1$   
 $y=-2x+11$

$$f(x) = \begin{cases} 2x-9 & \text{if } x < 5 \\ -2x+11 & \text{if } x \geq 5 \end{cases}$$

6.  $f(x) = 5\left|-\frac{1}{2}x+3\right|$   
 $5\left|-\frac{1}{2}(x-6)\right|$   
 $m = 5 \cdot \left|\frac{1}{2}\right| = \frac{5}{2}$   
(6, 0)

left  
 $y = -\frac{5}{2}(x-6)$   
 $y = -\frac{5}{2}x + 15$

right  
 $y = \frac{5}{2}(x-6)$   
 $y = \frac{5}{2}x - 15$

$$f(x) = \begin{cases} -\frac{5}{2}x+15 & \text{if } x < 6 \\ \frac{5}{2}x-15 & \text{if } x \geq 6 \end{cases}$$

Part I. Carefully graph each of the following. Identify whether or not the graph is a function. Then, evaluate the graph at any specified domain value. You may use your calculators to help you graph, but you must sketch it carefully on the grid!

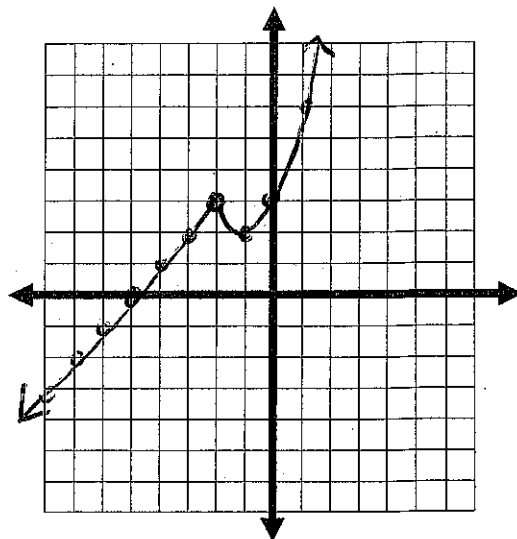
1.  $f(x) = \begin{cases} x+5 & x < -2 & (-2, 3) \\ x^2 + 2x + 3 & x \geq -2 & (-2, 3) \end{cases}$

Continuous  
Function? Yes or No

$f(3) = (3)^2 + 2(3) + 3 = 18$

$f(-4) = (-4) + 5 = 1$

$f(-2) = 3$



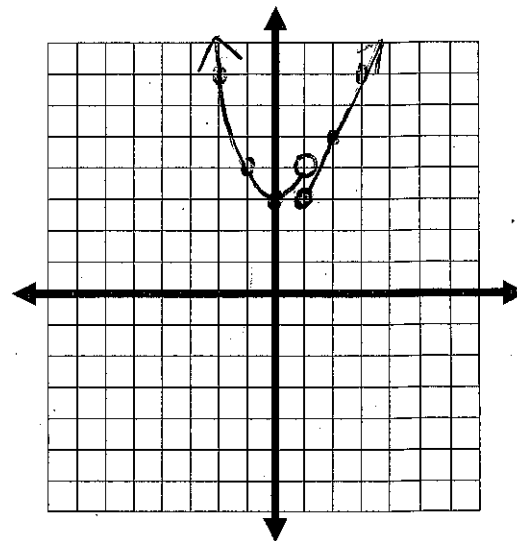
2.  $f(x) = \begin{cases} 2x+1 & x \geq 1 & (1, 3) \\ x^2 + 3 & x < 1 & (1, 4) \end{cases}$

Continuous  
Function? Yes or No

$f(-2) = 7$

$f(6) = 13$

$f(1) = 3$



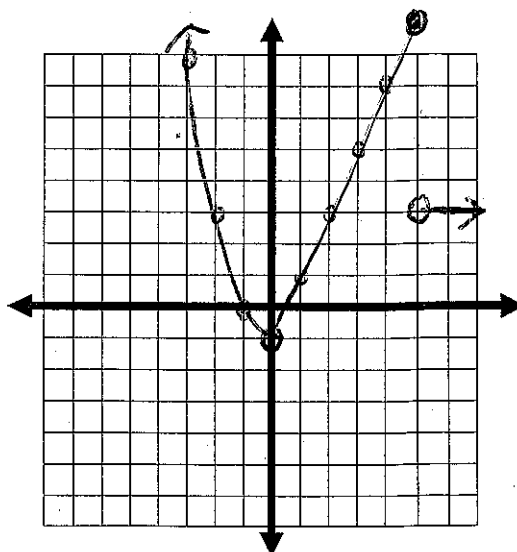
3.  $f(x) = \begin{cases} x^2 - 1 & x \leq 0 & (0, -1) \\ 2x - 1 & 0 < x \leq 5 & (0, -1) \quad (5, 9) \\ 3 & x > 5 & (5, 3) \end{cases}$

Continuous  
Function? Yes or No

$f(-2) = 3$

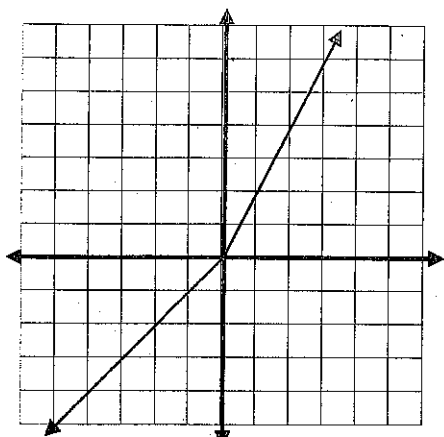
$f(0) = -1$

$f(5) = 9$



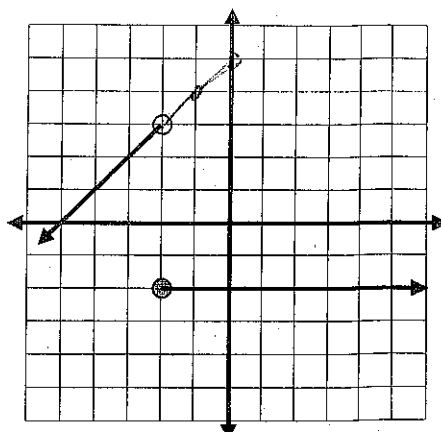
Part II. Write equations for the piecewise functions whose graphs are shown below. Assume that the units are 1 for every tic mark.

4.



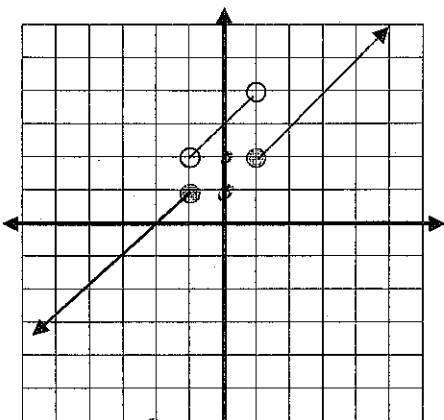
$$f(x) = \begin{cases} x & x \leq 0 \\ 2x & x > 0 \end{cases}$$

5.



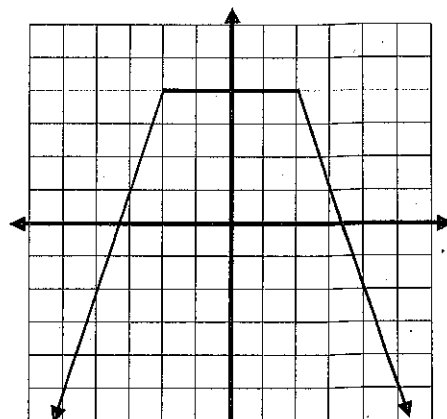
$$f(x) = \begin{cases} x+5 & x < -2 \\ -2 & x \geq -2 \end{cases}$$

6.



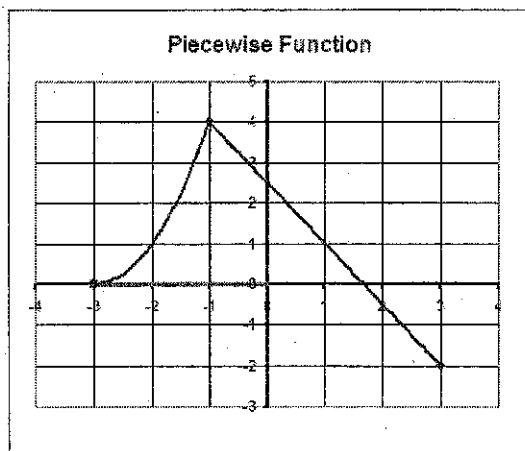
$$f(x) = \begin{cases} x+2 & x \leq -1 \\ x+3 & -1 < x < 1 \\ x+1 & x \geq 1 \end{cases}$$

7.



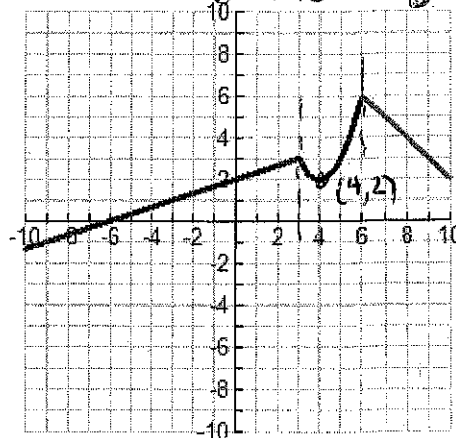
$$f(x) = \begin{cases} 3x+10 & x \leq -2 \\ 4 & -2 < x \leq 2 \\ -3x+10 & x \geq 2 \end{cases}$$

8.



$$f(x) = \begin{cases} (x+3)^2 & -3 \leq x < -1 \\ -\frac{3}{2}x+2.5 & -1 \leq x \leq 3 \end{cases}$$

9.



$$f(x) = \begin{cases} \frac{1}{3}x+2 & x \leq 3 \\ (x-4)^2+2 & 3 < x \leq 6 \\ -x+12 & x > 6 \end{cases}$$