

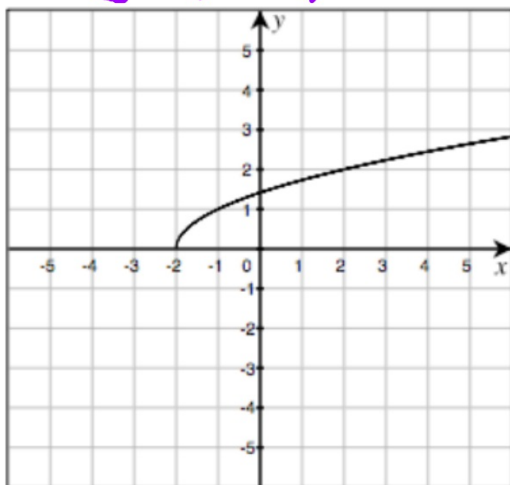
Content and Language Objective:

Students will explore the characteristics of piecewise graphs to help them analyze and interpret graphs that are not always continuous, to help learn the process for writing piecewise functions.

Warm Up

- 1.) Find the domain of the function shown in the graph below.

$[-2, \infty)$



- 2.) Given the function $f(x) = x^2 - 2x + 5$, find the following function values:

a) $f(0)$

$0^2 - 2(0) + 5$
 $f(0) = 5$

b) $f(-3)$

$(-3)^2 - 2(-3) + 5$
 $9 + 6 + 5 = 20$
 $f(-3) = 20$

c) $f(4)$

$(4)^2 - 2(4) + 5$
 $16 - 8 + 5 = 13$

Content and Language Objective:

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Let's read through the objective and fill in the statements below:

Students will explore the characteristics of piecewise graphs

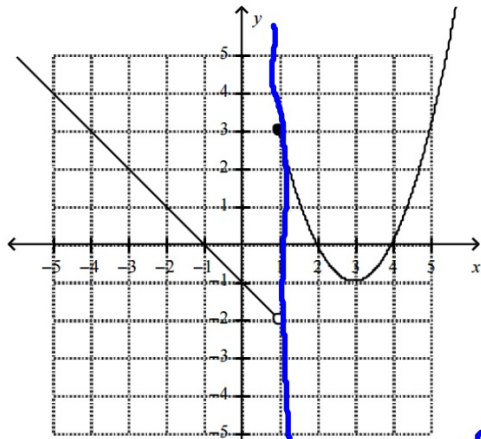
In order to analyze and interpret graphs

So they learn the process for writing piecewise functions

Content and Language Objective:

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Describe the graph below. Then compare it



y int = -1 slope = $-\frac{1}{2}$

$$f(x) = \begin{cases} -x - 1 & , \text{if } x < 1 \\ x^2 - 6x + 8 & , \text{if } x \geq 1 \end{cases}$$

A piecewise function is a function represented by two or more functions, each corresponding to a part of the domain.

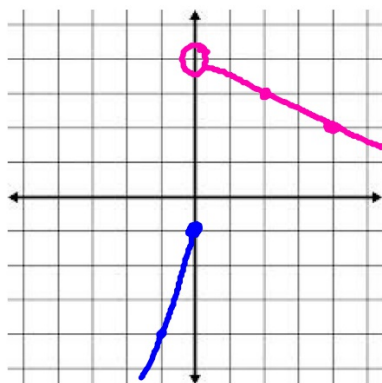
A piecewise function is called piecewise because it acts differently on different “pieces” of the number line.

Content and Language Objective:

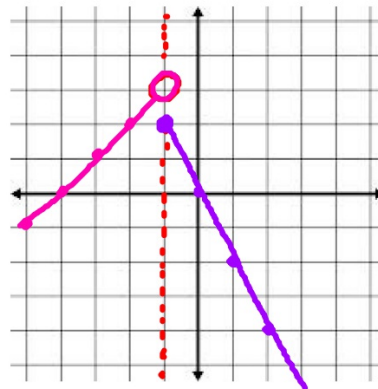
Students will explore the characteristics of piecewise graphs to help them analyze and interpret graphs that are not always continuous, to help learn the process for writing piecewise functions.

Graph the piecewise function $f(x) = \begin{cases} 3x - 1 & , \text{if } x \leq 0 \\ -\frac{1}{2}x + 4 & , \text{if } x > 0 \end{cases}$.

What kind of function is this? Explain.
Predict what the graph will look like.



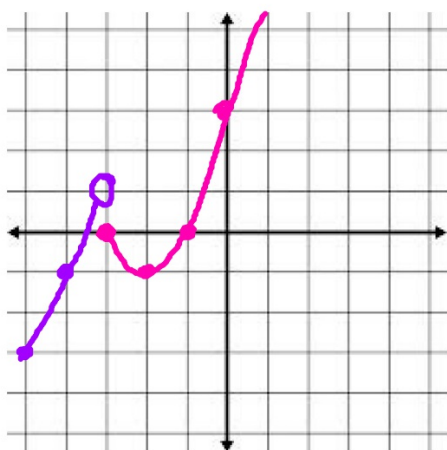
Graph the function $f(x) = \begin{cases} x + 4 & , \text{if } x < -1 \\ -2x & , \text{if } x \geq -1 \end{cases}$.



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Graph the function $f(x) = \begin{cases} 2x + 7, & \text{if } x < -3 \\ x^2 + 4x + 3, & \text{if } x \geq -3 \end{cases}$.



Evaluate $f(x)$ when (a) $x = 0$, (b) $x = 2$, and (c) $x = 4$.

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

$$f(0) = 0 + 2 = 2 \quad \boxed{f(0) = 2}$$

$$f(2) = 2(2) + 1 = 5 \quad \boxed{f(2) = 5}$$

$$f(4) = 2(4) + 1 = 9 \quad \boxed{f(4) = 9}$$

x	y
-3	1
-4	-1
-5	-3

x	y
-3	0
-2	-1
-1	0
0	3

$$\begin{aligned} &(-3)^2 + 4(-3) + 3 \\ &9 - 12 + 3 \\ &-3 + 3 \end{aligned}$$

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Example 3: The function below describes the price of a movie ticket (in dollars) depending on the age of the person (in years). Graph $p(x)$.

$$p(x) = \begin{cases} 8 & , \text{if } 0 < x < 16 \\ 11 & , \text{if } 16 \leq x < 55 \\ 8 & , \text{if } x \geq 55 \end{cases}$$

Discuss the meaning of the function:

People under 16 years of age pay \$8 per ticket

People who are at least 16 year of age, but younger than 55 years old pay \$11 per ticket.

People who are 55 years old or older pay \$8 per ticket.

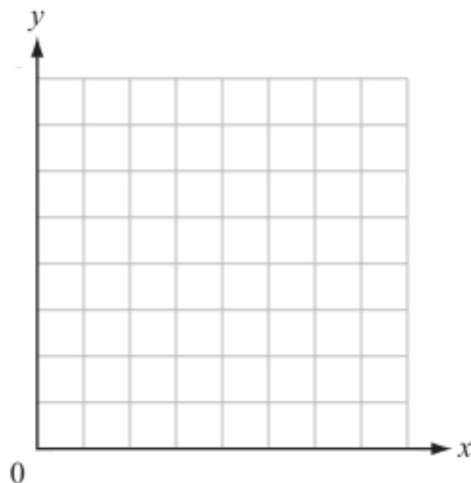
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Try:

Graph the function $f(x) = \begin{cases} 6, & \text{if } 0 < x \leq 50 \\ 10, & \text{if } 50 < x \leq 100 \\ 15, & \text{if } 100 < x \leq 200 \end{cases}$.

Write a scenario represented by this function.



EVALUATING FUNCTIONS Evaluate the function for the given value of x .

$$f(x) = \begin{cases} 5x - 1, & \text{if } x < -2 \\ x - 9, & \text{if } x \geq -2 \end{cases}$$

$$h(x) = \begin{cases} \frac{1}{2}x - 10, & \text{if } x \leq 6 \\ -x - 1, & \text{if } x > 6 \end{cases}$$

13. $f(-4)$

14. $f(-2)$

15. $f(0)$

16. $f(5)$

17. $h(1)$

18. $h(-10)$

19. $h(6)$

20. $h(0)$

GRAPHING FUNCTIONS Graph the function.

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

22. $f(x) = \begin{cases} x + 6, & \text{if } x \leq -3 \\ -\frac{2}{3}x - 3, & \text{if } x > -3 \end{cases}$

23. $f(x) = \begin{cases} 2x + 13, & \text{if } x \geq -5 \\ x + \frac{1}{2}, & \text{if } x < -5 \end{cases}$

24. $f(x) = \begin{cases} -x, & \text{if } x > 2 \\ x - 4, & \text{if } x \leq 2 \end{cases}$

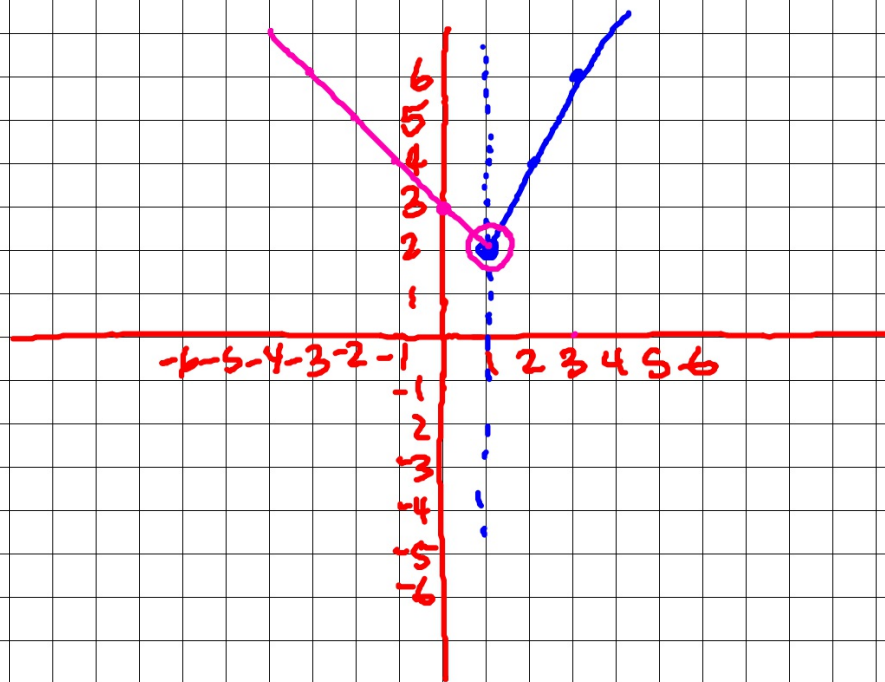
13. $f(-4) = 5(-4) - 1 = -21$

14. $f(-2) = -2 - 9 = -11$

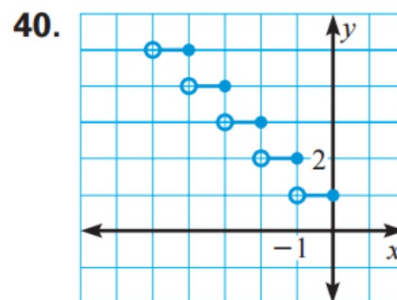
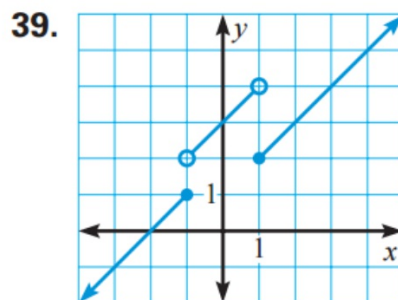
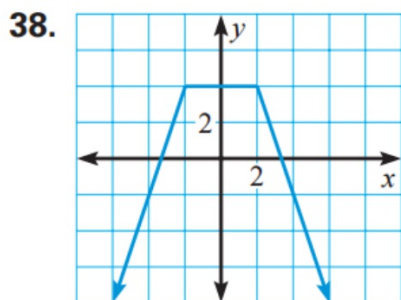
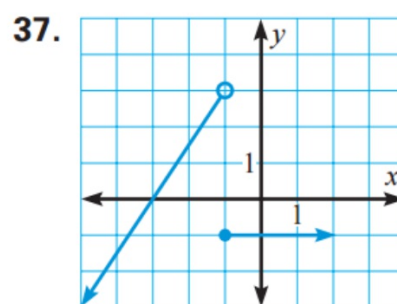
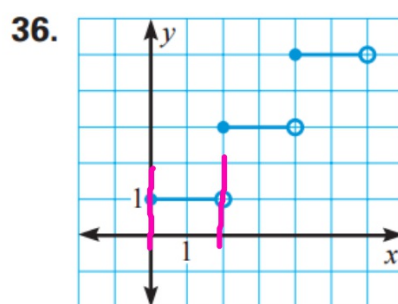
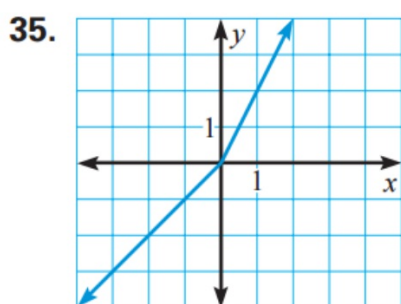
15. $f(0) = 0 - 9 = -9$

16. $f(5) = 5 - 9 = -4$

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



WRITING PIECEWISE FUNCTIONS Write equations for the piecewise function whose graph is shown.



36.
$$f(x) = \begin{cases} 1 & 0 \leq x < 2 \\ 3 & 2 \leq x < 4 \\ 5 & 4 \leq x < 6 \end{cases}$$

Let $g(x) = \begin{cases} 3 + x^2 & \text{if } x < -2 \\ 2x & \text{if } -2 \leq x < 1 \\ 11 - x^2 & \text{if } x \geq 1 \end{cases}$. Complete parts a – f below:

a. $g(3)$

b. $g(-1)$

c. $g(-2)$

d. $g(4)$

e. Graph $g(x)$.

f. State the domain and range of $g(x)$.