

Piecewise Functions

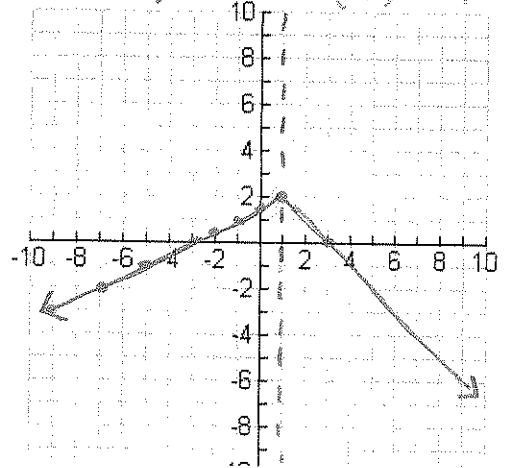
- In real life functions are represented by a combination of equations, each corresponding to a part of the domain.
- These are called piecewise functions.
- One equation gives the value of $f(x)$ when $x \leq 1$
And the other when $x > 1$

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

Example: Evaluate $f(x)$ when $x=0, x=2, x=4$
 ① figure out what equation
 - NEVER use both

$$f(x) = \begin{cases} x + 2, & \text{if } x < 2 \rightarrow x=0 \quad f(0) = 2 \\ 2x + 1, & \text{if } x \geq 2 \rightarrow x=2 \quad f(2) = 5 \\ & \rightarrow x=4 \quad f(4) = 9 \end{cases}$$

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

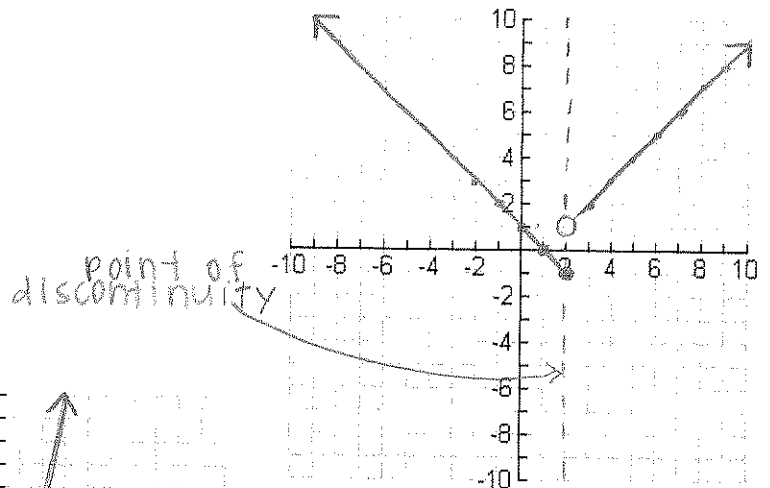


Make a table for each piece. Be sure to select appropriate x values.

Use open circle for $<$ or $>$

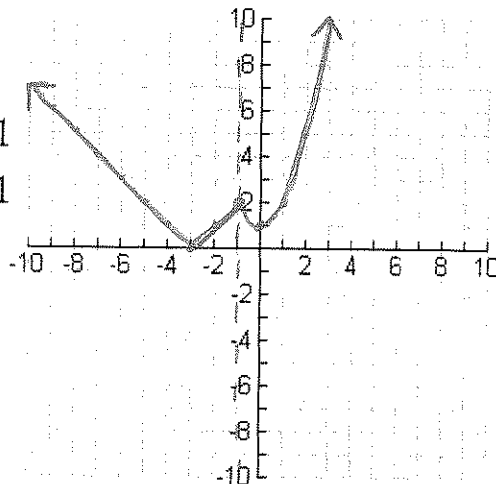
Use closed circle for \leq or \geq

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



Graph:

$$f(x) = \begin{cases} |x + 3| & \text{if } x \leq -1 \\ x^2 + 1 & \text{if } x > -1 \end{cases}$$



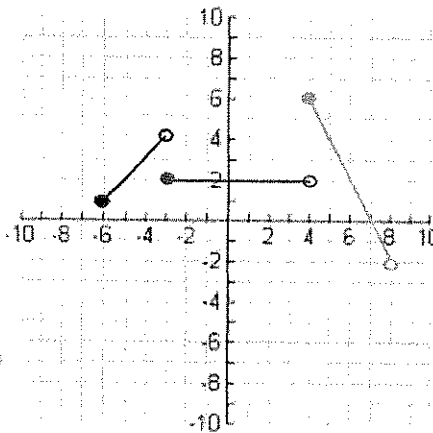
Lesson 2: Writing piecewise functions given a graph.

3. Can you identify the equations of the lines that contain each segment?

a. Left segment equation = $x + 7$

b. Middle equation = $y = 2$

c. Right equation = $-2x + 14$



4. Next, list the domain of each segment.

a. Left segment domain = $-6 \leq x < -3$

b. Middle domain = $-3 \leq x < 4$

c. Right domain = $4 \leq x < 8$

5. Now, put the domain together with the equations to write the piecewise function for the graph.

$$f(x) = \begin{cases} x + 7, & -6 \leq x < -3 \\ 2, & -3 \leq x < 4 \\ -2x + 14, & 4 \leq x < 8 \end{cases}$$

$f(-6) \rightarrow 1$
 $f(4) \rightarrow 6$
 $f(8) \rightarrow \text{undefined}$
 $f(10) \rightarrow \text{undefined}$

Piecewise Functions Practice

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

$f(3) = 18$

$f(-4) = 1$

$f(-2) = -5$

