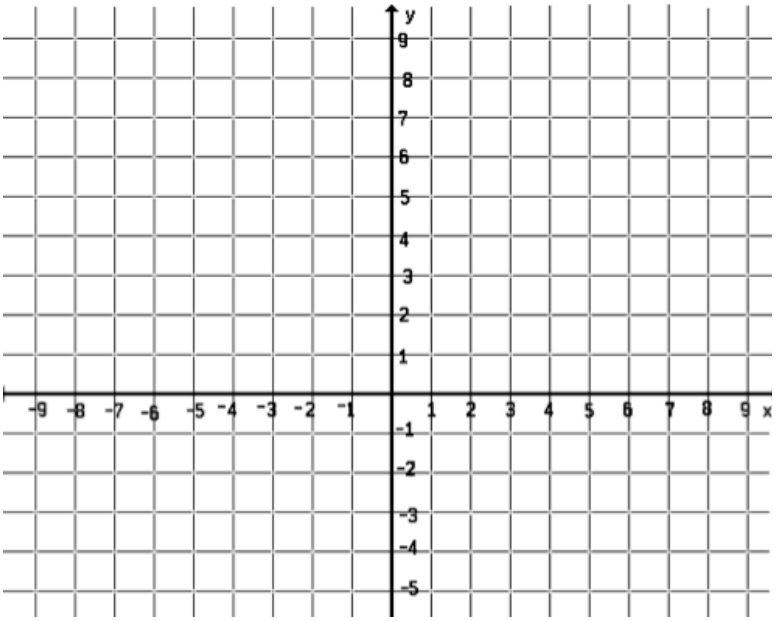
Integrated Math 3
Unit 3: Representing Functions
3.9

Name: _____

Date: _____ Period: _____

Objective: What is a piecewise function?

a) Graph the function: $y = |x|$ on the coordinate plane provided.



b) Pretend there are no values to the right of the y-axis. Write an equation of the line left over.

Equation of the line to the left of y-axis:

c) Pretend there are no values to the left of the y-axis. Write an equation of the line left over.

Equation of the line to the right of the y-axis:

d) Putting it all together:

For all **negative** x-values ($x < 0$) the function is: _____
For all **positive** x-values, and zero, ($x \geq 0$) the function is: _____

Therefore, we have to different functions that make up one larger function together.

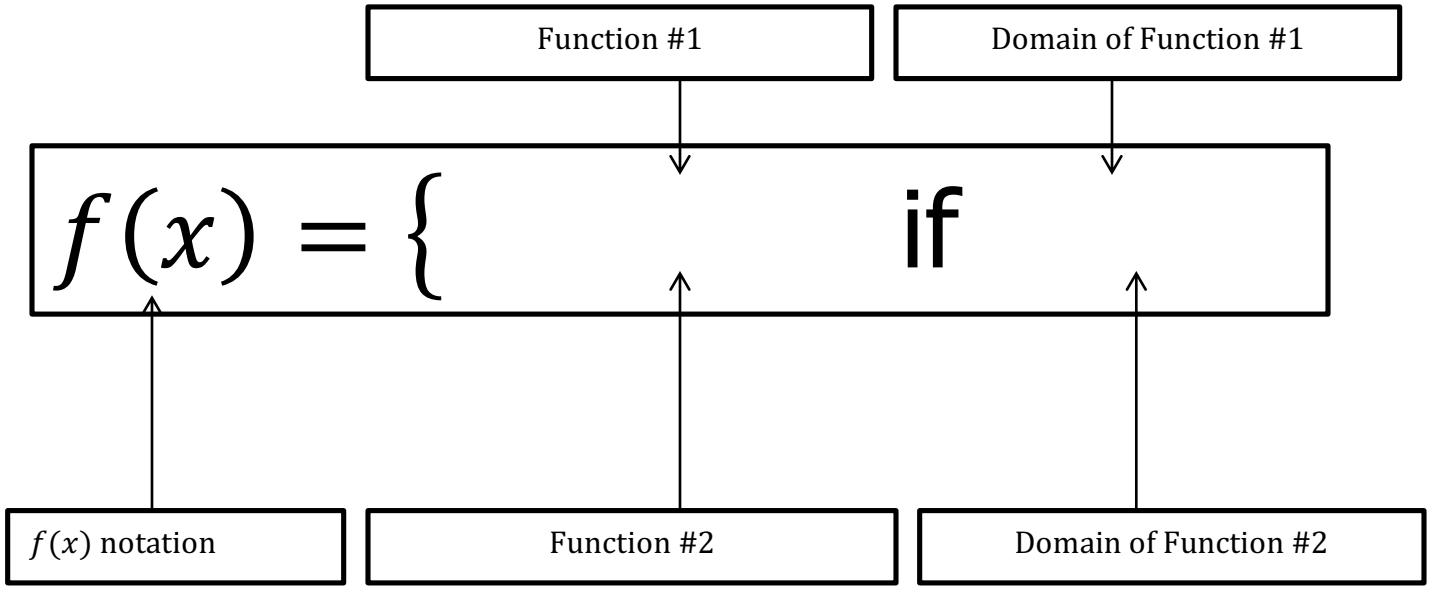
Vocabulary to Consider

Piecewise function: a function that is comprised of 2 or more functions, which have restrictions on their domains.

Domain: the set of x-values and/or inputs that are allowed

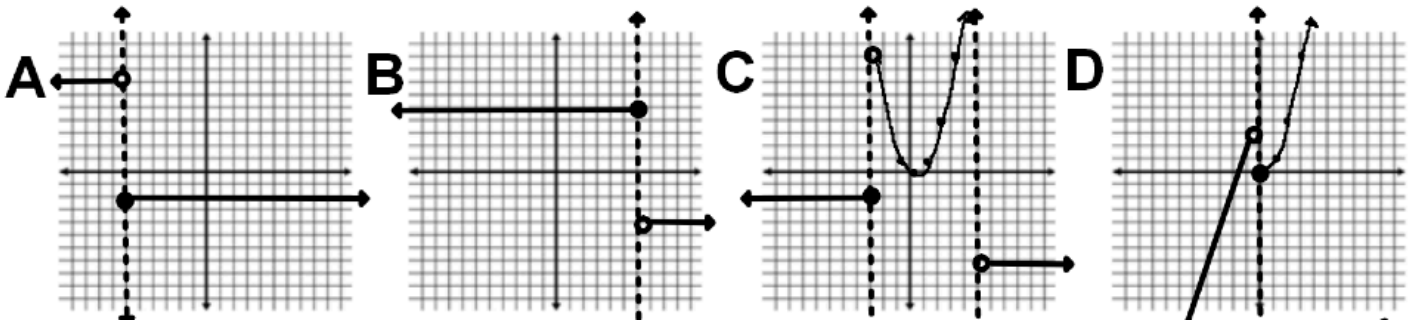
Restricted domain: the domain for each individual function within the piecewise function

What does a piecewise function look like?



Let's write a piecewise function to represent the identical meaning of an absolute value function:

Practice: Match the following piecewise functions to their graphs.



1. _____ 2. _____ 3. _____ 4. _____

$f(x) = \begin{cases} 2x + 3 \ if \ x < 0 \\ x^2 \ if \ x \geq 0 \end{cases}$ $f(x) = \begin{cases} 7 \ if \ x < -6 \\ -2 \ if \ x \geq -6 \end{cases}$ $f(x) = \begin{cases} 5 \ if \ x \leq 6 \\ -4 \ if \ x > 6 \end{cases}$ $f(x) = \begin{cases} x^2 \ if \ -3 < x \leq 5 \\ -2 \ if \ x \leq -3 \\ -7 \ if \ x > 7 \end{cases}$

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Objective: Evaluate and write piecewise functions

Warm up: Given the functions $f(x) = 2x + 3$ and $g(x) = 4x$, evaluate $f(1)$ and $g(2)$.

Part I: Evaluating

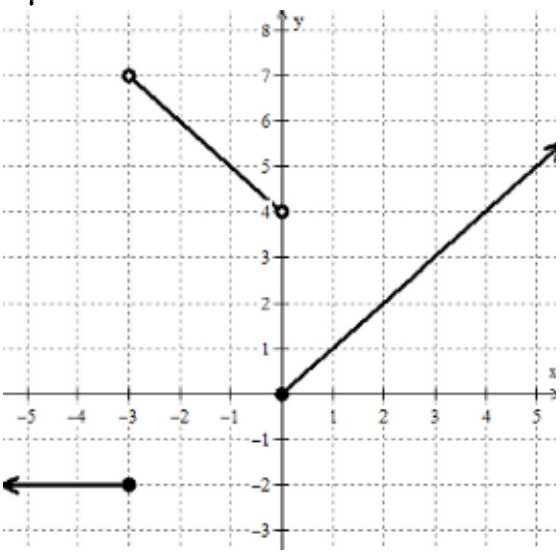
- Just as any function can be evaluated, evaluating a piecewise function comprises of finding the _____ for an indicated _____.
- However, since a piecewise function is comprised of multiple functions, you must look at the _____ before you evaluate the function.

Examples:

1. Given the piecewise function $f(x) = \begin{cases} 2x \ if \ x \geq 1 \\ -x + 3 \ if \ x < 1 \end{cases}$
   - Evaluate $f(-1)$
   - Evaluate $f(1)$
   - Evaluate $f(4)$

2. Given the piecewise function $f(x) = \begin{cases} \frac{1}{2}x + \frac{3}{2} \ if \ x < -1 \\ -x + 3 \ if \ x \geq -1 \end{cases}$
   - Evaluate $f(1)$
   - Evaluate $f(-1)$
   - Evaluate $f(-3)$

Part II: Writing (How to Write a Piecewise from a Graph)



Answer the following questions based on the given graph.

1. What type of function is graphed?

2. How many equations are drawn? *Label each equation with a letter (A, B, etc.)*

3. For the equation labeled equation A

   a) What x-values are being graphed?

   b) Is there a "closed dot" or an "open dot"?

   c) What restricted domain can you write using parts a & b?

   d) If you were to write an equation of the line drawn, what would you write?

4. For the equation labeled equation B

   a) What x-values are being graphed?

   b) Is there a "closed dot" or an "open dot"?

   c) What restricted domain can you write knowing parts a & b?

   d) If you were to write an equation of the line drawn, what would you write?

5. For the equation labeled equation C

   a) What x-values are being graphed?

   b) Is there a "closed dot" or an "open dot"?

   c) What restricted domain can you write knowing parts a & b?

   d) If you were to write an equation of the line drawn, what would you write?

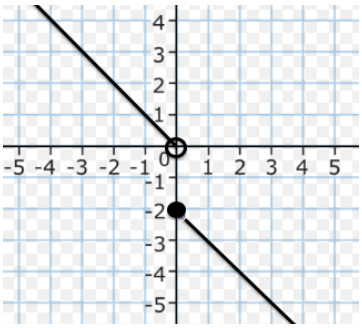
6. Putting together questions 3c,d, 4c,d and 5c,d, please construct the **piecewise function** that is graphed.

In conclusion, a piecewise function <u>must include:</u>

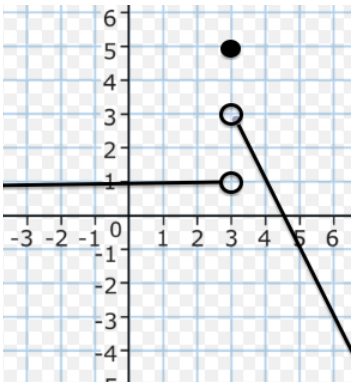
- Function notation
- A separate equation for each "part" of the graph.
- A restricted domain for each "part" of the graph---*(what x-values are being included for each "part"?)*

Examples: Write a piecewise function that corresponds to the graphs below.

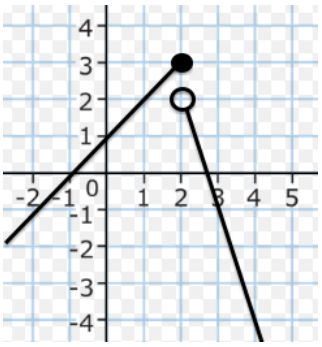
a.



b.



c.



d.