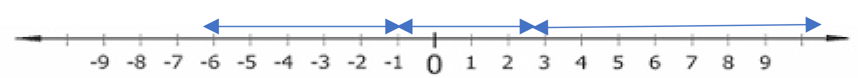
Piecewise Functions (Values and Graphs)

Piecewise functions occur when different parts of the domain are governed by different rules, or sub-functions. Similar to a piecewise functions, we have different rules for different parts of our lives, such as before and after learning to drive.

Example

Here is an example of a piecewise function:

$$F(x) = \begin{cases} 2x+1 & if\ x < -1 \\ -2 & if\ -1 \le x \le 3 \\ -3x+7 & if\ x > 3 \end{cases}$$



We can determine values for F(x), or y, we would get if we are given a specific x.

1. $F(-3) = 2(-3) + 1 = -6 + 1 = -5$ *hint*: use sub-function 1 since -3 is included in that domain
2. $F(0) = -2$ *hint*: use sub-function 2 since 0 is included in that domain
3. $F(5) = -3(5) + 7 = -15 + 7 = -8$ *hint*: use sub-function 3 since 5 is included in that domain
4. $F(3) = -2$ *hint*: use sub-function 2 since 3 is included in that domain

Note: Watch which sub-function' s domain actually has the equal bar, this means that it will include that value not just get really close.

You Try:

1. $F(-5)$

2. $F(-1)$

3. $F(7)$

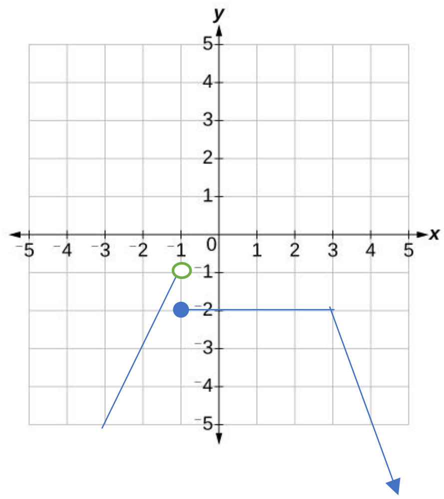
Graphing:

Another important skill is to be able to graph a piecewise function. You will use the tools that you learned previously when graphing a linear function.

The domain can be indicated when graphing by using arrows, open circles and closed circles.

> or < use an open circle	≥ or ≤ use a closed circle	$-\infty$ *or* $+\infty$ use an arrow

Let's graph the piecewise function from the example. Pick two points for each rule, usually endpoints unless they extend towards infinity.



1) $F(x) = 2x + 1$ $\quad if\ x < -1$, this domain begins at $-\infty$ and stops $at\ -1$, so we can pick $x = -1$ and any other x in this domain, let's try -2.

x	$F(x)$ = y	endpoint
-2	-3	Go to the point and extend the line to show that it goes until x = $-\infty$
-1	-1	use open circle for the endpoint since we have an <

Note: *you can also use the slope-intercept method*

2) $F(x) = -2$ $\quad if\ -1 \leq x \leq 3.$ use the endpoints.

x	$F(x)$ = y	endpoint
3	-2	Use a closed circle for both endpoints since we have $\leq$
-1	-2	Use a closed circle for both endpoints since we have $\leq$

3) $F(x) = -3x + 7$ $\ if\ x > 3$, this domain begins at $x = 3$ and ends at $+\infty$, pick any other point in the domain.
Note: *you can also use the slope-intercept method.*

x	$F(x)$ = y	endpoint
3	-2	Would use an open circle but it overlaps with the previous line.
5	-8	use an arrow at the end of the line since it will extend until $+\infty$.

You Try:

4. Graph:

$$F(x) = \left\{ \begin{array}{ll} -2x - 4 & if\ x \leq -2 \\ -2 & if\ -2 < x \leq 2 \\ 3x - 7 & if\ x > 2 \end{array} \right\}$$

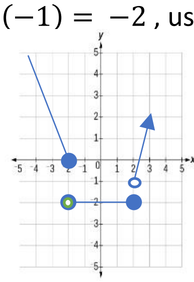
You Try Answers:

1. $F(-5) = 2(5) + 1 = -9$, use sub-function 1;

2. $F(-1) = -2$, use sub-function 2;

3. $F(7) = -3(7) + 7 = -14$, use sub-function 3;

4.



This instructional aid was prepared by the Tallahassee Community College Learning Commons.