

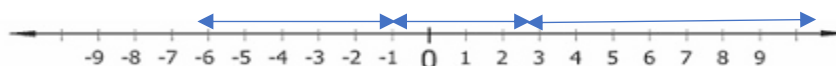
Piecewise Functions (Values and Graphs)

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:

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



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. $F(7)$

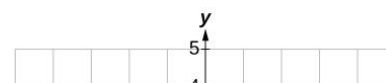
Graphing:

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.

$> \text{ or } <$ use an open circle	$\geq \text{ or } \leq$ use a closed circle	$-\infty \text{ or } +\infty$ 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) $F(x) = 2x + 1$ 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) $F(x) = -2$ 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:

$$F(x) = \begin{cases} -2x - 4 & \text{if } x \leq -2 \\ -2 & \text{if } -2 < x \leq 2 \\ 3x - 7 & \text{if } x > 2 \end{cases}$$

You Try Answers:

- $F(-5) = 2(5) + 1 = -9$, use sub-function 1;
- $F(-1) = -2$, use sub-function 2;
- $F(7) = -3(7) + 7 = -14$, use sub-function 3;

4.

