

[4.7] Graphing piece-wise defined function with a unit step function

This is another method to plot piece-wise continuous functions. The advantage to this method is that the piece-wise function is defined as a single function, and can easily be integrated, differentiated, or combined with other functions.

First, define the unit step function $u(t)$ as

```
u(t)
func
when(t < 0, 0, 1)
endfunc
```

Electrical engineers know this as the unit step function; mathematicians call it Heaviside's step function.

You can use the unit step function to 'turn on' various graph segments. This is done by multiplying the function by the appropriate unit step function:

1. For $x > x_1$, use $u(x - x_1)$
2. For $x_1 \leq x \leq x_2$, use $u(x - x_1) - u(x - x_2)$
3. For $x < x_1$, use $u(x_1 - x)$

For example, suppose we have three functions $f_1(x)$, $f_2(x)$ and $f_3(x)$. $f_1(x)$ is used for $x < -1$, $f_2(x)$ is used for $-1 < x < 2$, and $f_3(x)$ is used for $x > 2$. Use the unit step function to define the complete function like this:

$$y_1(x) = f_1(x) * u(-1 - x) + f_2(x) * [u(x - (-1)) - u(x - 2)] + f_3(x) * u(x - 2)$$

(Credit to TipDS)