

# Piecewise (Hybrid) Functions

Wednesday, 18 April 2018 2:01 PM

★ Work to be complete by the end of the teaching:

5E: Piecewise (Hybrid) Functions 192 1abde 2 4 5 6bc 8

## RECAP:

We have already talked extensively about functions. We have covered:

- What a function is
- How to write a function using function notation
- Domains
- Ranges
- Real Numbers and Integers
- Vertical line tests (to test for a function)
- How to restrict a function

Now we look at how to draw more than one relation/function on a graph.

Hybrid functions - also known as Piecewise Functions

Not everything in life follows one perfect graphs. It would be lovely if everything in life was described by a parabola (for example). Every y-value has an x-value which is defined by one single rule.

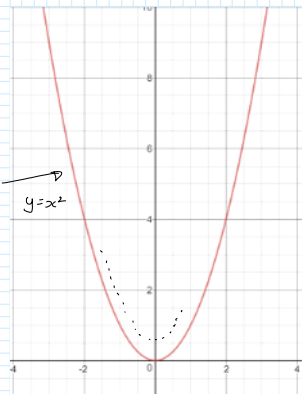
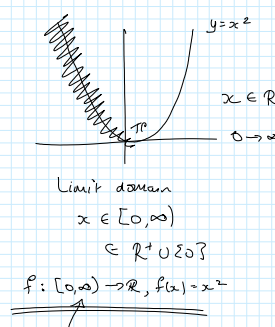
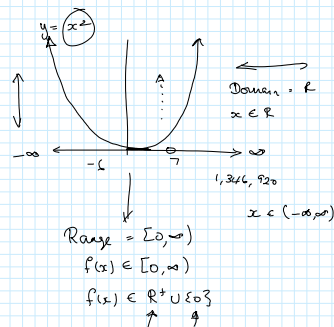
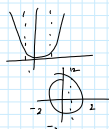
Relation & function

$$y = mx + c$$

$$y = x^2$$

$$x^2 + y^2 = 4$$

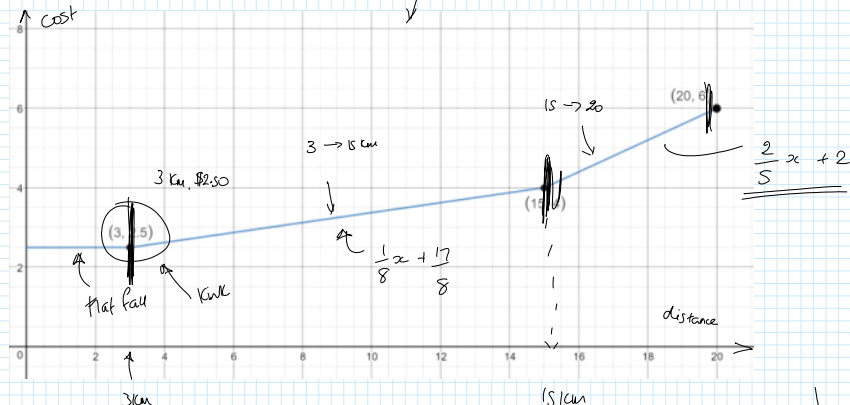
$$f: [0, \infty) \rightarrow \mathbb{R}, f(x) = x^2$$



Look at what happens when you take a taxi.

- Before the taxi leaves there is a flat fall.
- Then, for a certain distance the price will be set at one value per kilometre.
- After a certain distance the price will change and you will have a different relation.

We obviously don't draw three different graphs, we draw them all on one graph by describing them in a certain way:



This graph has a flat fall of \$2.50 for the first 3 km. Then it has a rate which grows depending on the number of kilometres you have done between 3 km and 15 km. The rate increases even more between 15 km and 20 km.

The above graph is called a **Hybrid function**.  
How is this described using Mathematical Notation?

$$f(x) = \begin{cases} 2.5, & 0 < d \leq 3 \\ y = \frac{1}{8}x + \frac{17}{8}, & 3 < d \leq 15 \\ y = \frac{2}{5}x - 2, & 15 < d \leq 20 \end{cases}$$

Just another way of saying "y ="

curly brace

Each section has it's own domain

3 sections so 3 equations

## Drawing Hybrid Functions

In most cases in Mathematics we will be asked to draw or interpret hybrid functions. So, drawing them is all about understanding how to read the function!

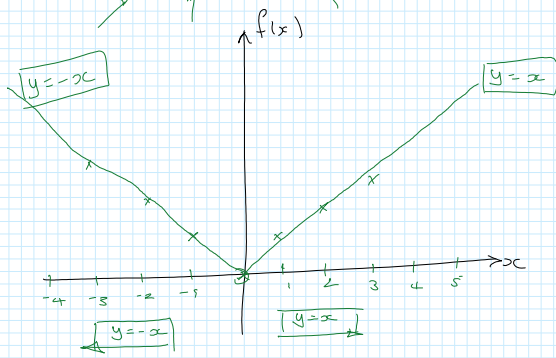
Example: Sketch the following hybrid function

$$f(x) = \begin{cases} -x, & x \leq 0 \\ x, & x > 0 \end{cases}$$

- Make sure to find the y-value where they meet!

$$f(x) = \begin{cases} -x, & x \leq 0 \\ x, & x > 0 \end{cases}$$

Where they meet!



label axes  
label graphs

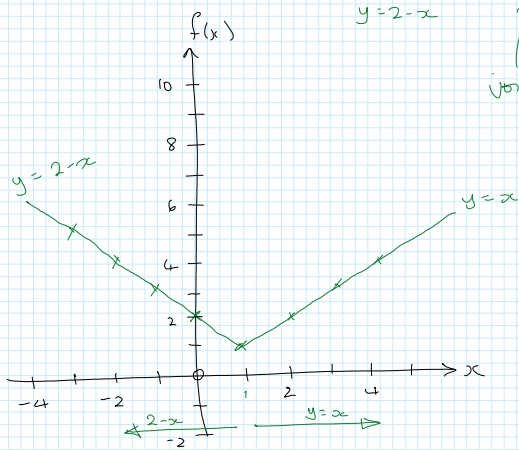
②

$$f(x) = \begin{cases} x, & x \geq 1 \\ 2-x, & x < 1 \end{cases}$$

When  $x=1$ ,  $y=1$

When  $x=1$ ,  $y=1$

Meet at  $(1,1)$



Always have an idea of  
what the graphs should  
look like.

If all else fails  
then plot the graph!