

# Sums and products of functions

Monday, 29 January 2018 8:02 pm

★ By the end of the lesson I would hope that you have an understanding of the concepts below which you can apply to a number of complex questions:

- What it means to sum two functions
- What it means to find the product of two functions
- How to sketch the sum and product of functions
- What it means by addition of ordinates

## RECAP:

We have spent some time, in previous lessons, looking at all the language we use for functions.

Now it's time to start playing with actual function.

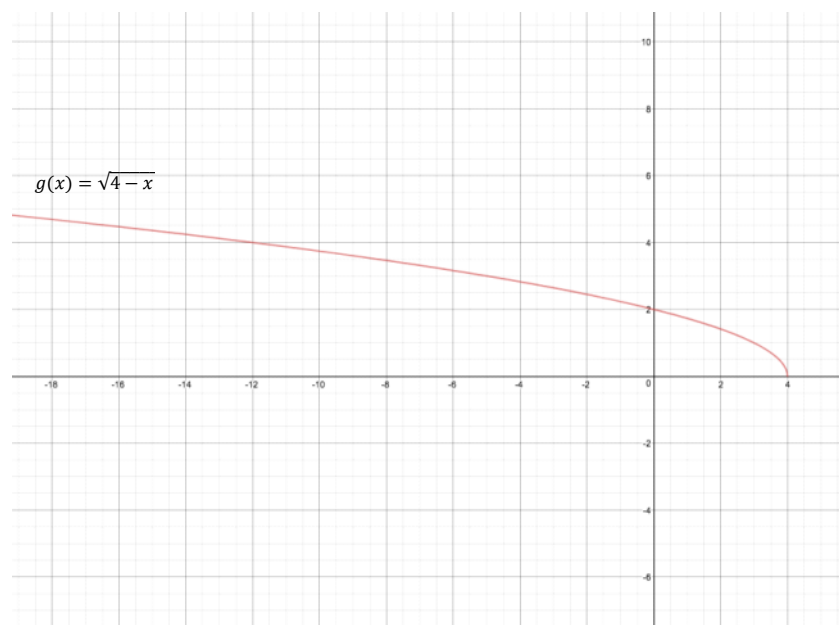
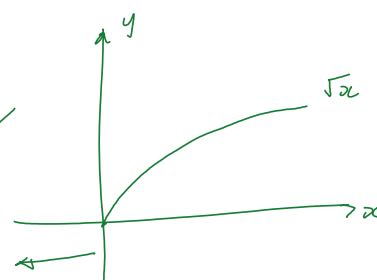
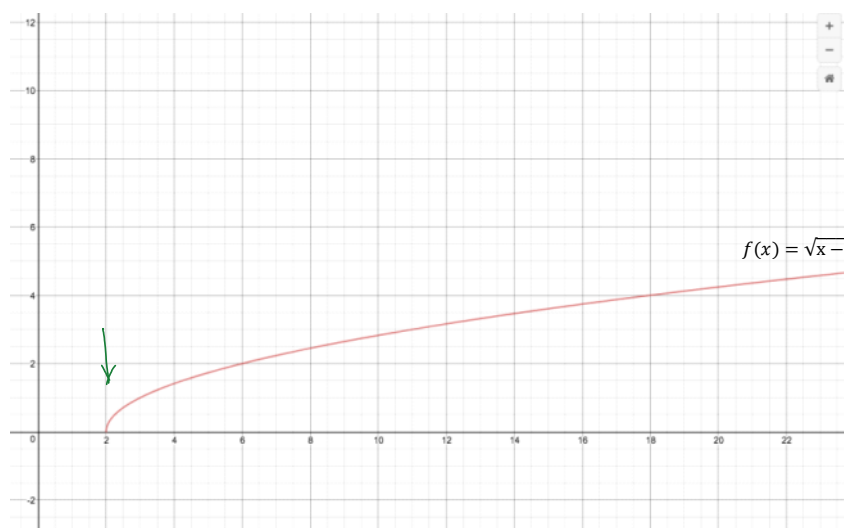
Again, it's really important that you start to learn what each of the functions look like.

This will help immensely with the work you will do all year!

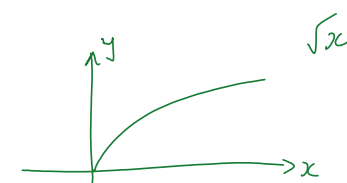
## Summing two functions

Summing functions together is actually pretty easy!

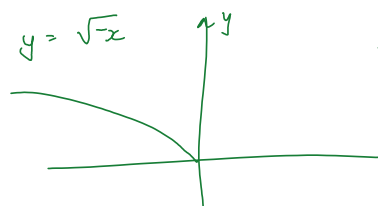
If you have two functions and you sum them together you are effectively adding the two 'y' values together to get a new value. Shown below are two functions:



$$g(x) = \sqrt{4-x}$$



$$y = \sqrt{-x}$$



$$\sqrt{-(x-4)}$$

It's really important to know how to transform graphs! Chapter 3 and onwards make you draw hundreds of graphs! It's important to know the hints and the tricks used.

## Maths is a Big Fat Trick!

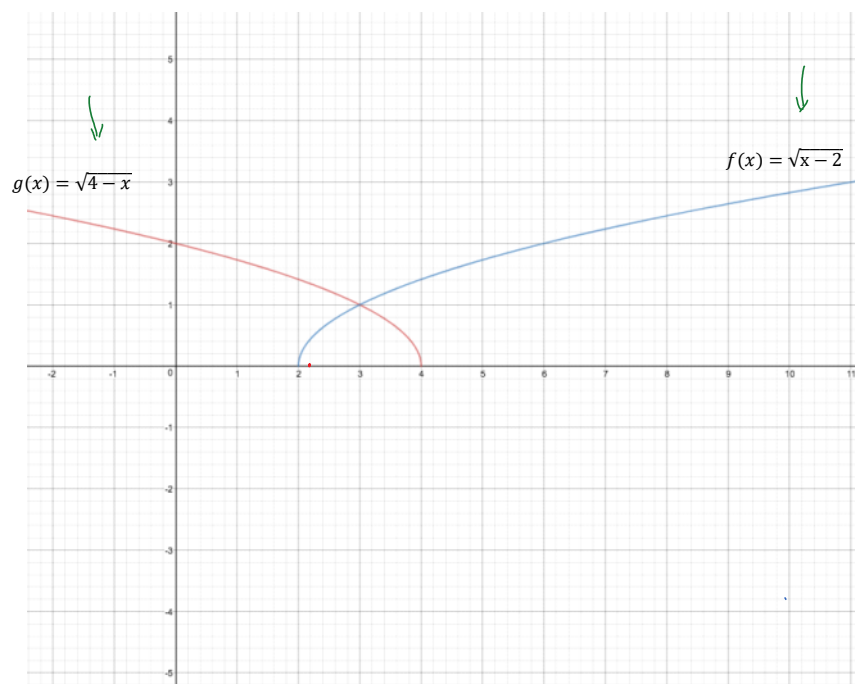
It's all too easy to be tricked with the function:  $g(x) = \sqrt{4-x}$

Notice how the 4 and the  $x$  are written the other way around! This suggests there has been a reflection in the  $y$ -axis.

Be very careful when you are trying to sketch functions.

Back to the Maths!

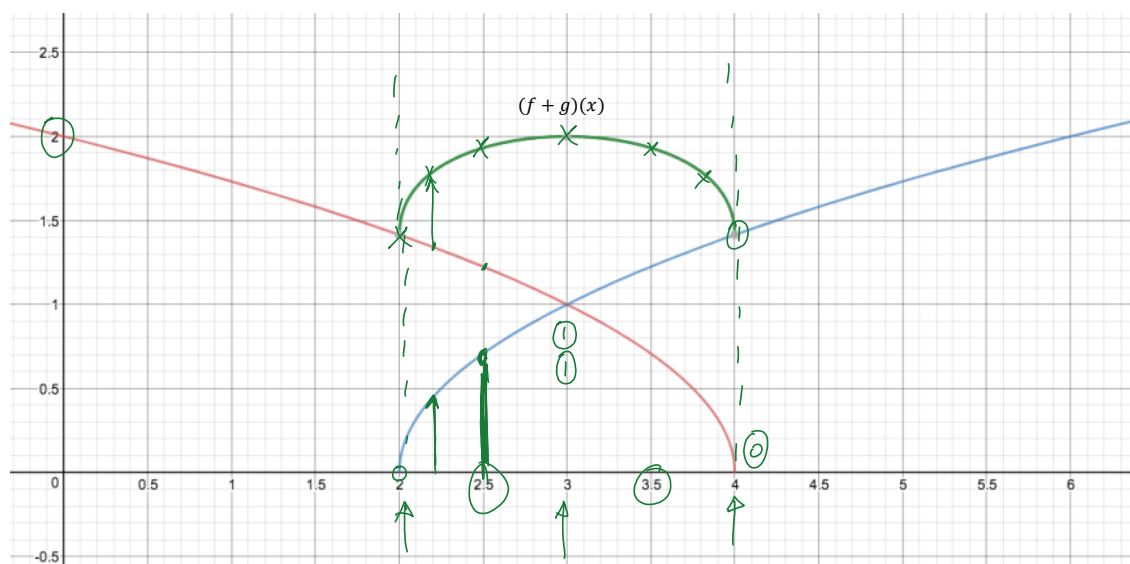
Putting them on the same graph gives:



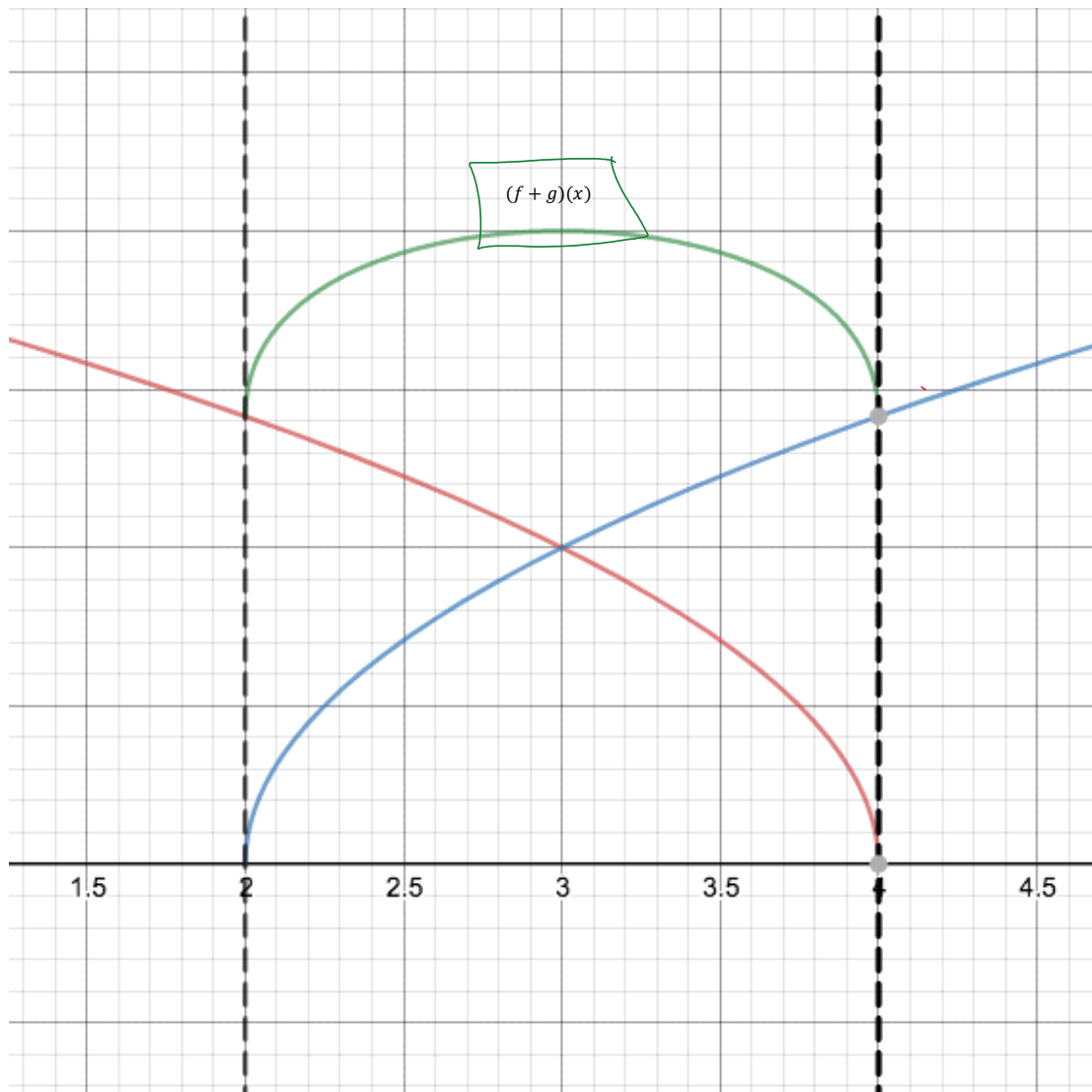
Zooming in:



Adding them together so we have  $f(x) + g(x) \dots$



If we zoom in we can see the domain is only valid between 2 and 4



Notation ...

$$f(3) =$$

$$(f+g)(x) = f(x) + g(x)$$

$$(f+g)(3) = f(3) + g(3)$$

$$\text{dom}(f+g) = \text{dom } f \cap \text{dom } g$$

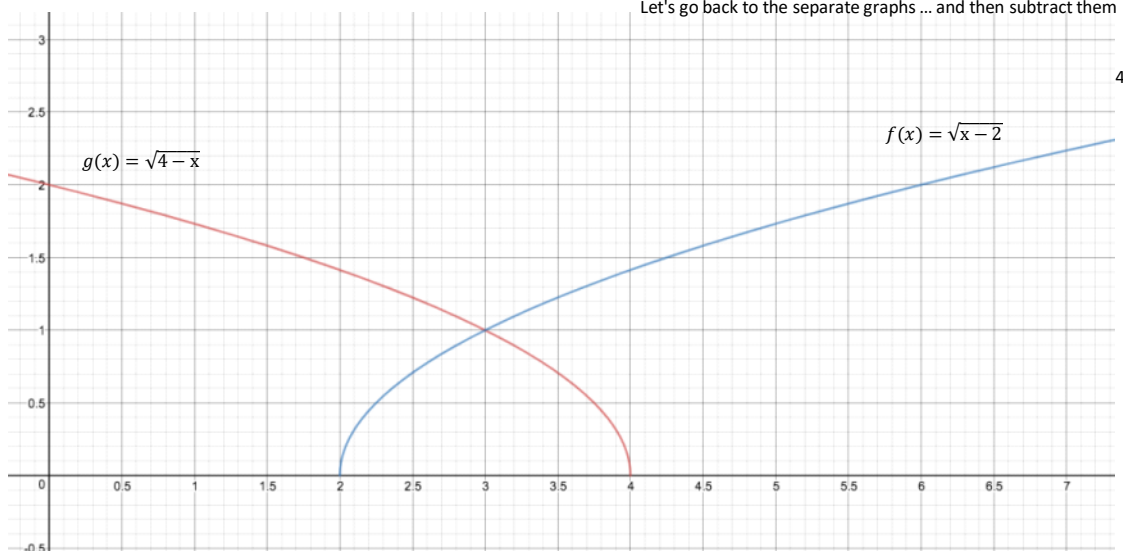
$$\leftarrow (f+g)(x) = f(x) + g(x)$$

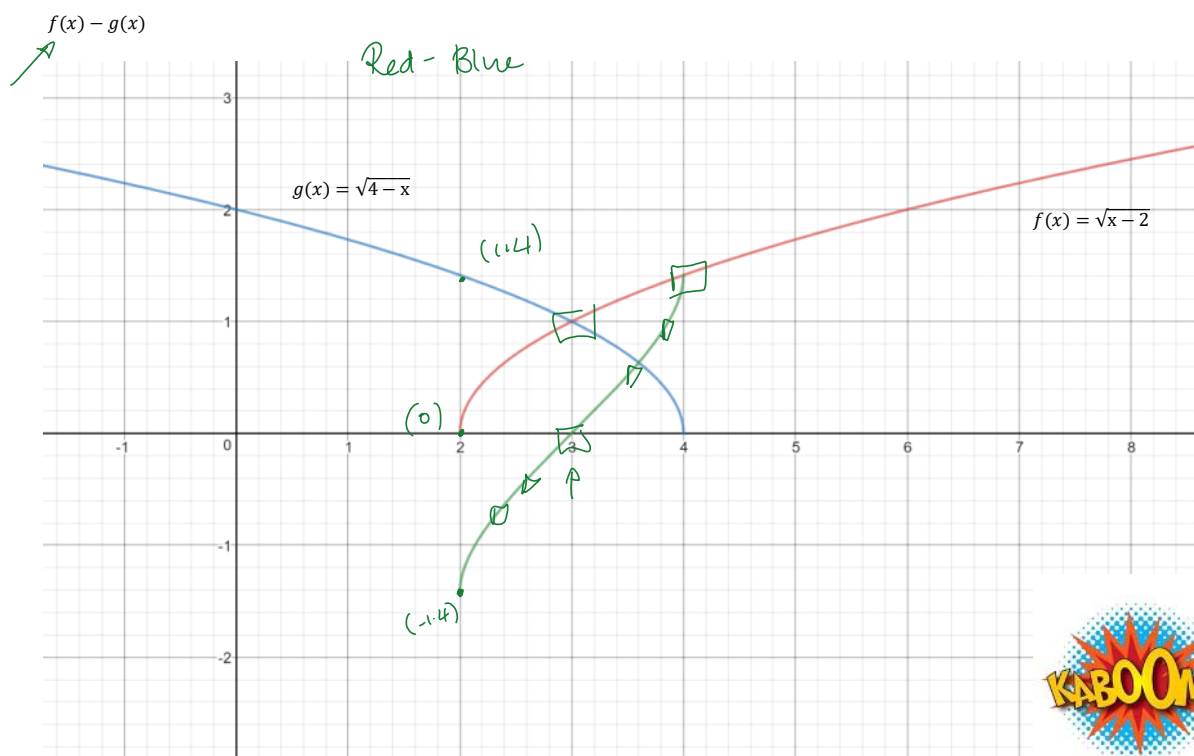
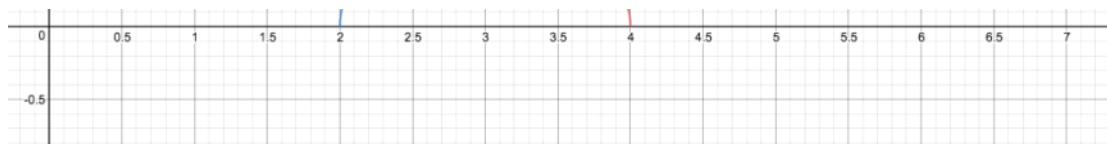
$$\leftarrow (f+g)(3) = f(3) + g(3)$$

$$\leftarrow$$

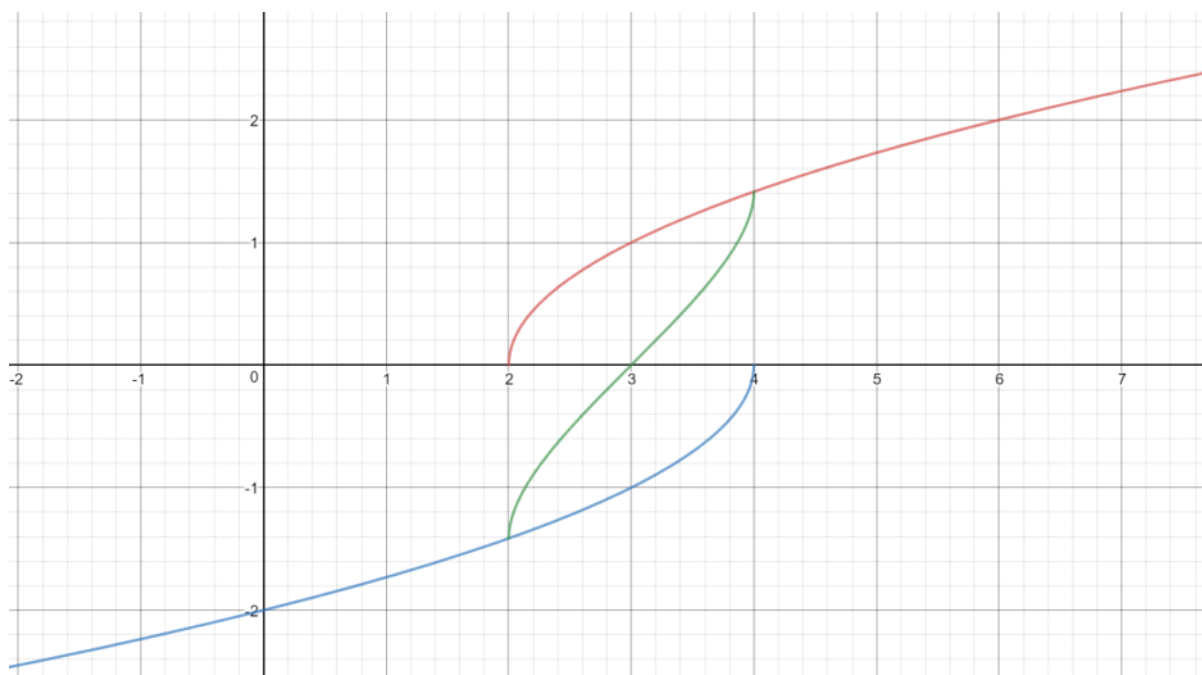
Subtracting ordinates

Let's go back to the separate graphs ... and then subtract them





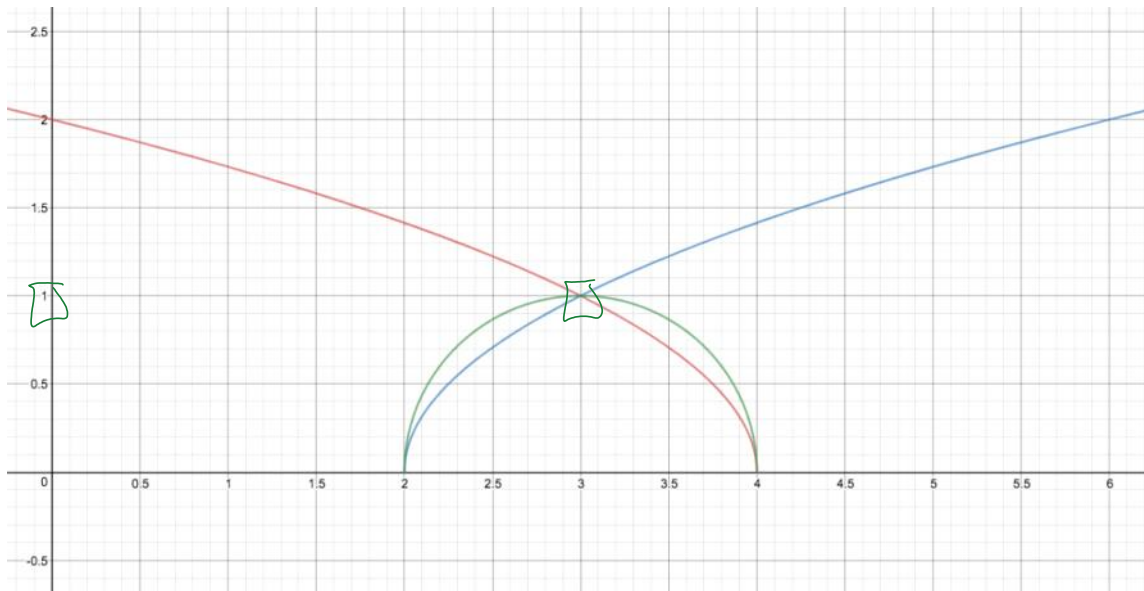
// Think of it as  $f(x) + -g(x)$  where we know that putting a negative in front of a graph means it is reflected in the  $x$ -axis



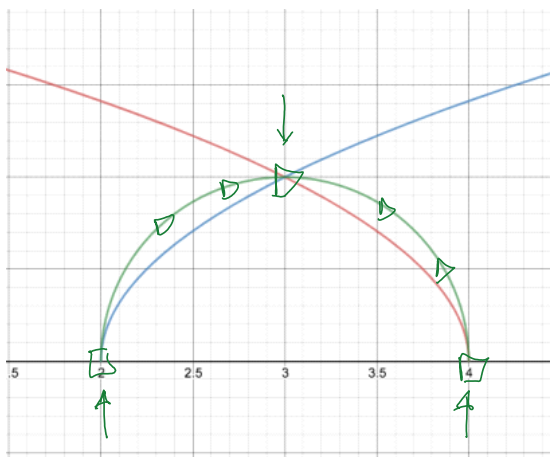
// **Domains, domains and more domains**  
It's important to note that the domain is only defined for the areas where  $f(x) \cap g(x)$

### Multiplying functions

Exactly the same thing applies when multiplying functions.  $(f \cdot g)(x) = f(x) \cdot g(x)$



Zooming in:



$$(f \cdot g)(x) = f(x) \times g(x)$$