Task:

In your groups discuss the definitions of the following

- Domain of a function
- Range of a function

Write a note in your learning journal that will help you to remember these definitions.

(i)   Find the domain and range of the following functions. Justify your answer algebraically and graphically

- $f(x) = x^2 + 2$
- $f(t) = \dfrac{1}{t+2}$
- $g(s) = \sqrt{3 - x}$

(ii)   *You are told that the height **h** of a certain projectile as a function of time in seconds is given by* $h = 20t - 4.9t^2$. *Find the domain and range of this function.*

We decided that the domain is a set and it is made up of only numbers that will make the function work. The function is working when the output is Real. The range is a set too it is all the numbers that come out when all the numbers in the domain go into the function.

(i) If $f(x) = x^2 + 2$

The domain is any Real number because there are no restrictions on x

x^2 is never negative so $x^2 + 2$ is always greater than 2

So the range of $f(x)$ is all real numbers $f(x) \geqslant 2$

x can be any value $f(x) \geqslant 2$
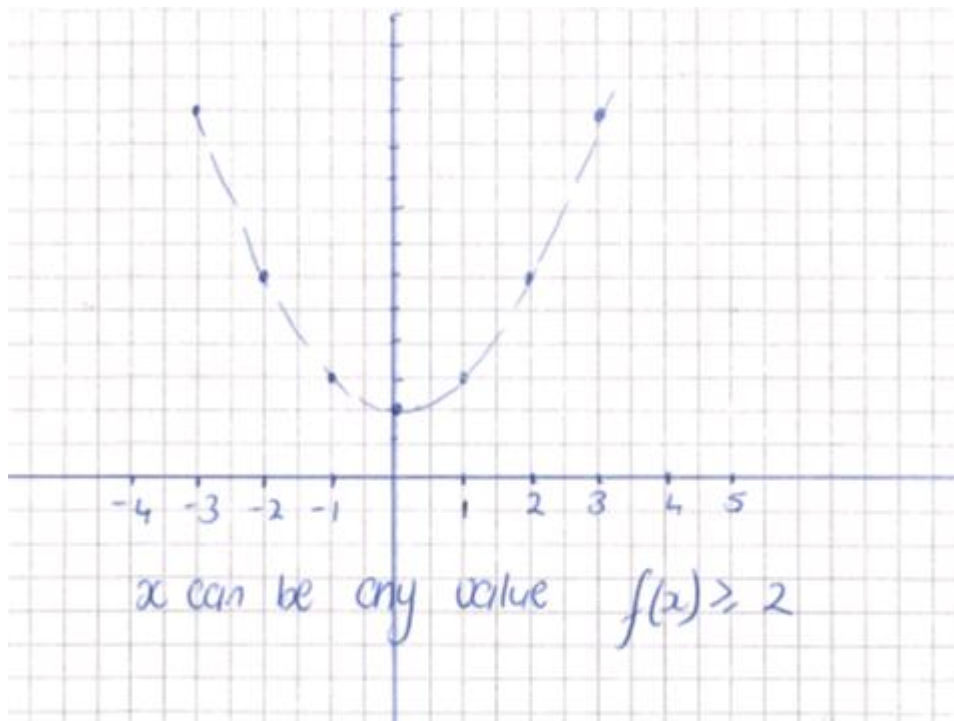
$$f(t) = \frac{1}{t+2}$$
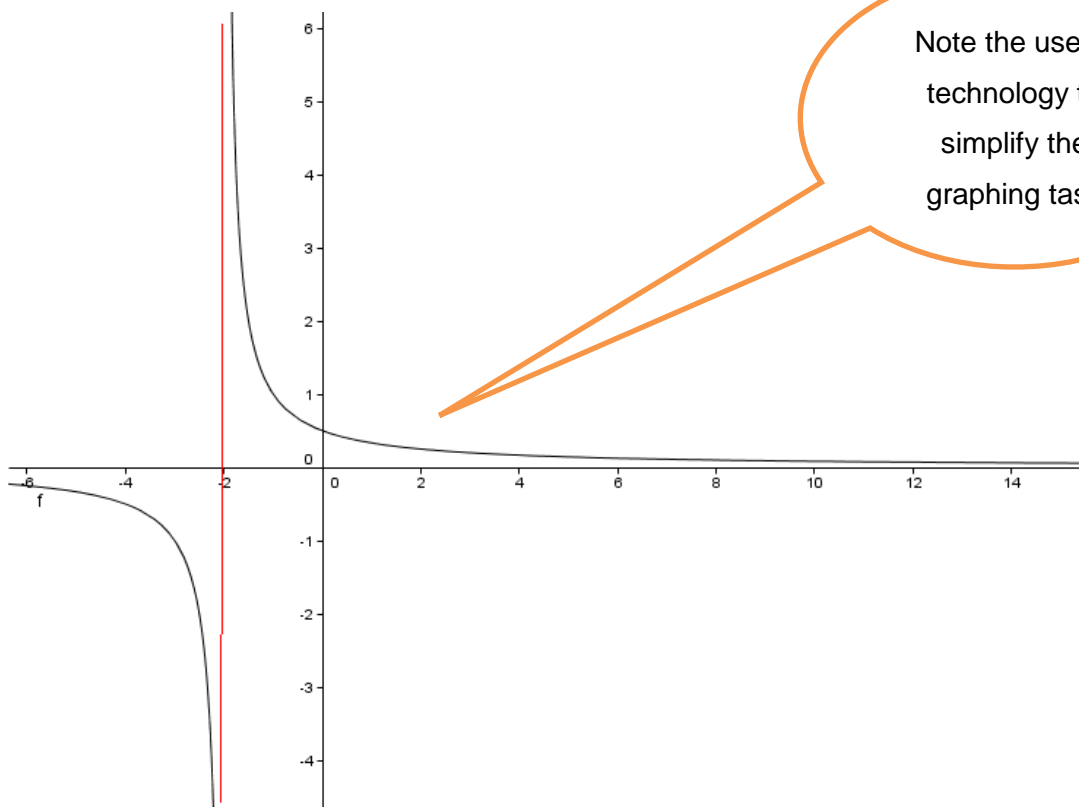
Domain Can be any number except -2 because

$t+2$ cannot be equal to 0

So $t+2 \neq 0$

$t \neq -2$

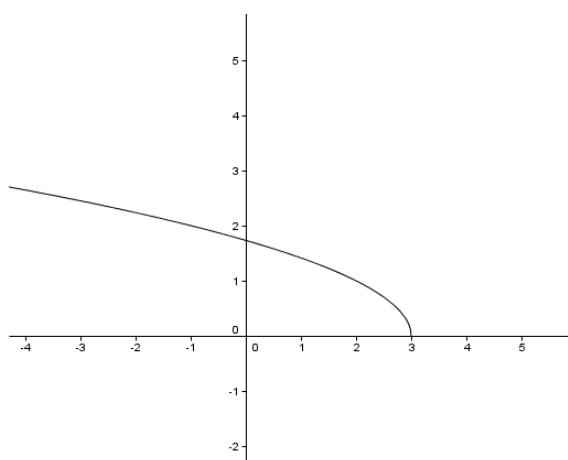No matter how large or small t gets $f(t)$ will never equal 0

Range is all real numbers except zero

Note the use of technology to simplify the graphing task

$$g(s) = \sqrt{3 - x}$$

$$3 - x \geq 0$$
$$-x \geq -3$$
$$x \leq 3$$

Domain is   all Real numbers $x \leq 3$

$g(s) \geq 0$ is the range

time values can't be negative
and the projectile hits the
ground and stops it doesn't
go underground. It hits the
ground when

$$20t - 4.9t^2 = 0$$
$$(20 - 4.9t)t = 0$$
$$t = 0 \quad \text{or} \quad 20 - 4.9t = 0$$
$$t = 4.08 \text{ secs}$$

So Domain is
   all real values of t $0 \leq t \leq 4.08$
       where

The Max height it goes to is
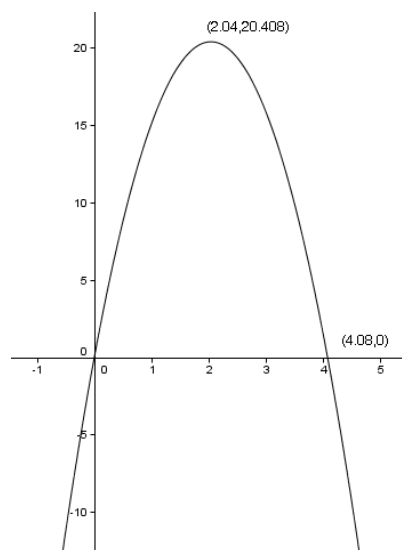   When $20 - 9.1t = 0$
$$9.1t = 20$$
     at $t = 2.04$ sec

So
$$h = 20(2.04) - 4.9(2.04)^2$$
$$= 20.408$$
Range is all real values
$$0 \leq h \leq 20.408$$

(2.04,20.408)

(4.08,0)

5

Note to students: The students whose work is displayed above used Geogebra as a tool to help their understanding of the concepts under investigation. Can you use Geogebra? Have you downloaded this onto your PC at home?

Look at the strategies the students used to decide on the domains and ranges of the functions; can you generalise the strategies used? Write a note in your journal outlining how you might find the domain and range of a function.

Extension: Now that you have a means of finding the domain and range of given functions, consider the reverse process. If you were given the range and domain of a function would you be able to sketch the graph of the function?