

Investigating Reciprocal Functions

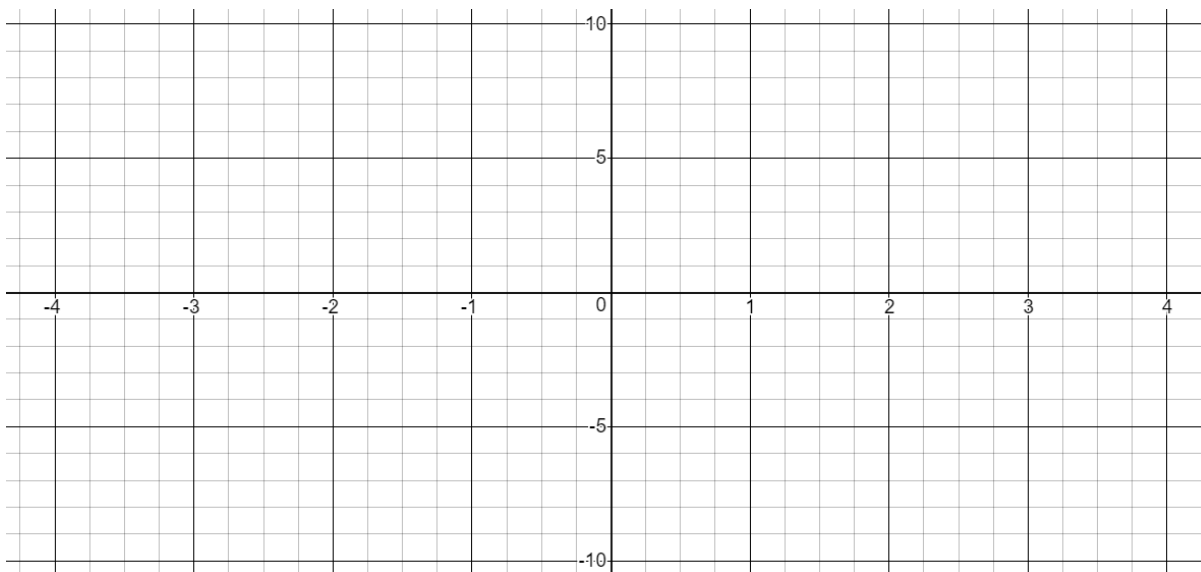
Investigation 1:

Complete the tables for the basic rational function: $y = \frac{1}{x}$

Then, plot the points and connect to create the curve.

x	y
0.1	
0.2	
0.25	
0.5	
1	
2	
3	
4	

x	y
-0.1	
-0.2	
-0.25	
-0.5	
-1	
-2	
-3	
-4	



Reflection Questions:

Describing “**end behavior**”:

a. As x-values get larger and larger (approaching infinity) what happens to the y-values?

b. As x-values get smaller and smaller (approaching negative infinity) will happens to y-values?

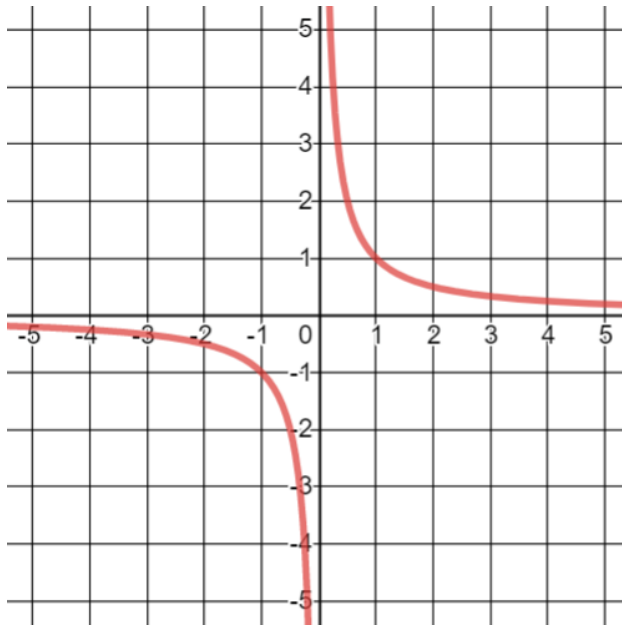
c. What happens as x-values approach zero from both the positive and the negative side? What is the y-value when $x = 0$?

d. Based on your reflections for a. – c., add a sketch of the horizontal asymptote and the vertical asymptote to the graph above.
State the domain: State the range:

$$x \in R, x \neq$$

Summary

The basic reciprocal function, $f(x) = \frac{1}{x}$



The limits of the function are:

=

=

=

=

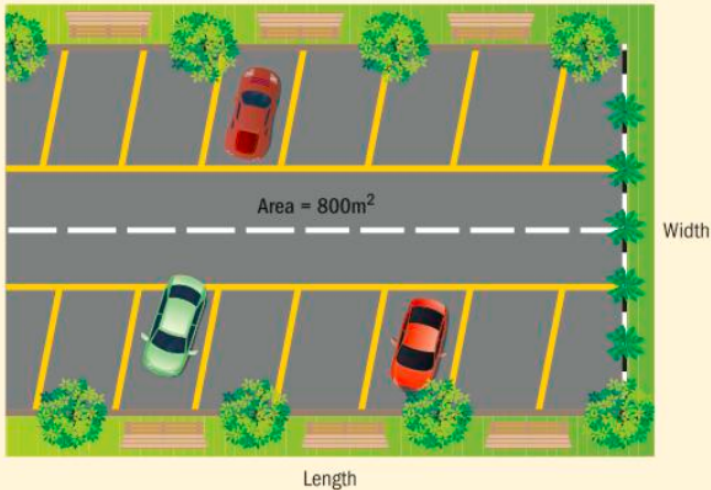
Add asymptotes to the graph to represent these limits.

For the reciprocal function $f(x) = \frac{k}{x}$, k is called the of the function.

- If x -values multiplied by y -values give a constant value, k , then

Investigation 2:

Your student's council is planning a new car park for your school but the local government laws state that the total area of the car park must be no more than 800 m². The students decide that it will be rectangular, and now have to decide on the length and width of the car park.



- 1 Work with a classmate to write, in a copy of the table below, some suggestions for the length and width of the car park which would give an area of 800 m².

Length (m)									
Width (m)									

- 2 **Factual** What type of relationship is this? How can you be sure? Can you write an equation linking the width (x metres) and the length (y metres) of the car park?
- 3 Plot a graph of this function on your GDC.
- For the car park to fit alongside the back entrance to school, the car park's length has to be twice its width.
- 4 Write this criterion as an equation in x and y . Plot the graph of this equation on the same axes as your original function.
- 5 Hence determine what the length and width of the car park will need to be.
- 6 **Factual** Are the values you found in question 5 the only possible values for the length and width, given the restrictions placed on the students? How can you be sure?
- 7 **Conceptual** How can you tell from a table of values that a real-life situation could be represented by a reciprocal function?

Applied Problem:

Adam's mobile phone has a limited amount of free space which he can use to store photos. Adam's phone has 240 MB (megabytes) of storage space.

The phone settings allow Adam to choose the default photo size (in MB). The photo size is the amount of storage space that each photo occupies on the phone.

- a** Copy and complete this table, which shows the default photo size and the number of photos that Adam can store on his phone.

Photo size [MB]	2	3	4	5	6	8	10	12	30
Number of photos	120				40				

- b** Write down a function for y , the number of photos Adam can store in his phone, in terms of the individual photo size, x .
- c** Use your GDC to plot a graph of the function you found in part **b**.

Adam wants to have space to store 50 photos on his phone.

- d** Use a graphical approach to find the maximum individual photo size (hint: plot an appropriate straight line on your GDC graph in part **c** to help you solve this problem graphically).
- e** Use an algebraic approach to find the maximum individual photo size.