

# Drawing the Graphs of Reciprocal Functions - PDF Copy

The presentation contains the slides below with the objective of enabling students to: **Draw the graphs of equations in the form:  $y = a/x + c$  and identify the asymptotes.** The presentation contains explanation and graphs to draw that can be checked with answers.

**Drawing the Graphs of Reciprocal Functions**

Objectives:  
 Draw the graphs of equations like  $y = a/x + c$  and identify the asymptotes from the equation

Grade C - A



1

The reciprocal of a number is the value obtained when we divide the number into one.

The reciprocal of 5, for example, is  $1 \div 5 = 0.2$

Usually, we write the divide sign in this way:  $1/5 = 0.2$

A way of writing 1 divided by 1



2

What are the reciprocals of these numbers?

1.  $10 \rightarrow 0.1$       6.  $0.4 \rightarrow 2.5$   
 2.  $8 \rightarrow 0.125$     7.  $0.2 \rightarrow 5$   
 3.  $4 \rightarrow 0.25$       8.  $0.1 \rightarrow 10$   
 4.  $2 \rightarrow 0.5$         9.  $0.05 \rightarrow 20$   
 5.  $1 \rightarrow 1$             10.  $0.01 \rightarrow 100$

Numbers bigger than 1 have reciprocals less than 1

1 has a reciprocal of 1

And numbers smaller than 1 have reciprocals bigger than 1



3

To draw the graph of  $y = 1/x$  we need some points to plot and to obtain these we have used the table below:

x	0.1	0.2	0.5	1	2	5	10
y							

Find the value of  $1 \div x$



4

To draw the graph of  $y = 1/x$  we need some points to plot and to obtain these we have used the table below:

x	0.1	0.2	0.5	1	2	5	10
$1/x$	10	5	2	1	0.5	0.2	0.1
y	10	5	2	1	0.5	0.2	0.1

So this is the y value



5

x	1.1	1.2	1.3	1	2	3	11
y	11	1	2	1	1.1	1.2	1.1

Plot the points with these coordinates

Draw the graph



6

x	1.1	1.2	1.3	1	2	3	11
y	11	1	2	1	1.1	1.2	1.1

The graph gets closer and closer to the y-axis but never crosses it

Graph of  $y = 1/x$

And closer and closer to the x-axis but never crosses it



7

x	1.1	1.2	1.3	1	2	3	11
y	11	1	2	1	1.1	1.2	1.1

All graphs that contain the reciprocal of x will have similar curves

Graph of  $y = 1/x$



8

Complete the table of values for the graph of  $y = 1/x + 4$  and then draw its graph

x	0.1	0.2	0.5	1	2	5	10
$1/x$			2		0.5		0.1
$1/x + 4$	14		6	5			
y							



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Complete the table of values for the graph of  $y = 1/x + 4$  and then draw its graph

x	0.1	0.2	0.5	1	2	5	10
$1/x$	10	5	2	1	0.5	0.2	0.1
$1/x + 4$	14	9	6	5	4.5	4.2	4.1
y	14	9	6	5	4.5	4.2	4.1



10

x	1.1	1.2	1.3	1	2	3	11
y	14	9	6	5	4.5	4.2	4.1

Graph of  $y = 1/x + 4$

Notice how the +4 in the equation moves the graph up

The line  $y = 4$

The graph gets closer and closer to the line  $y = 4$  but never crosses it



11

Complete the table of values for the graph of  $y = 1/(x+2)$  and then draw its graph

x	-19	-1.8	-1.6	-1	0	3	8
$x+2$				0.5	1		10
$1/(x+2)$						0.2	
y							



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Continued...

Complete the table of values for the graph of  $y = \frac{1}{\sqrt{x+2}}$  and then draw its graph

$x$	-19	-18	-1.6	-1	0	3	8
$x+2$	0.1	0.2	0.6	1	2	5	10
$\frac{1}{\sqrt{x+2}}$	10	6	2	1	0.6	0.2	0.1
$y$	10	6	2	1	0.6	0.2	0.1

☆ 13

$x$	1.1	1.2	1.3	1	2	3	11
$y$	14	7	4	3	4.3	4.2	4.1

The line  $x = -2$

Graph of  $y = \frac{1}{\sqrt{x+2}}$

Notice how the +2 in the equation moves the graph

☆ 14

Which two lines would you expect the graph of  $y = \frac{1}{\sqrt{x+8}} + 2$  to get closer and closer to but not cross?

The  $x$  value is this number with the opposite sign so its the line  $x = -4$

The  $y$  value is this number with the same sign so its the line  $y = 2$

☆ 15

Which two lines would you expect the graph of  $y = \frac{1}{\sqrt{x+8}} + 2$  to get closer and closer to but not cross?

The  $x$  value is this number with the opposite sign so its the line  $x = -4$

The  $y$  value is this number with the same sign so its the line  $y = 2$

Here is the graph

☆ 16

So for any graph that has the general form

$$y = \frac{1}{\sqrt{x+b}} + c$$

The line for  $x$  is the value of  $b$  with the opposite sign i.e.

If  $b$  was +3, it would be  $x = -3$  and if it was -3 it would be +3

The line for  $y$  is the value of  $c$  with the same sign

☆ 17

The other half of the graph...

☆ 18

For the equation  $y = \frac{1}{\sqrt{x-2}} + 3$  we have used the  $x$  values in the tables below...

$x$	-8	-3	0	1	1.6	1.8	19
$x-2$							
$\frac{1}{\sqrt{x-2}}$							
$\frac{1}{\sqrt{x-2}} + 3$							
$y$							

These give the  $y$  values...

$x$	2.1	2.2	2.6	3	4	7	12
$x-2$							
$\frac{1}{\sqrt{x-2}}$							
$\frac{1}{\sqrt{x-2}} + 3$							
$y$							

☆ 19

For the equation  $y = \frac{1}{\sqrt{x-2}} + 3$  we have used the  $x$  values in the tables below...

$x$	-8	-3	0	1	1.6	1.8	19
$x-2$	-10	-5	-2	-1	-0.6	-0.2	-10
$\frac{1}{\sqrt{x-2}}$	-0.1	-0.2	-0.6	-1	-2	-5	-10
$\frac{1}{\sqrt{x-2}} + 3$	2.9	2.8	2.6	2	1	-2	-7
$y$	2.9	2.8	2.6	2	1	-2	-7

Plotting these, we get the graph...

$x$	2.1	2.2	2.6	3	4	7	12
$x-2$							
$\frac{1}{\sqrt{x-2}}$	10	6	2	1	0.6	0.2	0.1
$\frac{1}{\sqrt{x-2}} + 3$	13	8	5	4	3.6	3.2	3.1
$y$	13	8	5	4	3.6	3.2	3.1

☆ 20

The graph has another half as shown

We can obtain the lines that each curve gets closer and closer to but does not cross from the equation

Lines like these are called asymptotes

☆ 21