GCSE Maths – Algebra

Sketching Graphs – Linear, Quadratic, Cubic and Reciprocal

Worksheet

NOTES

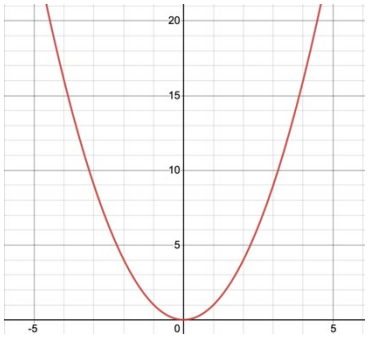
SOLUTIONS

This worksheet will show you how to work out different types of function questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

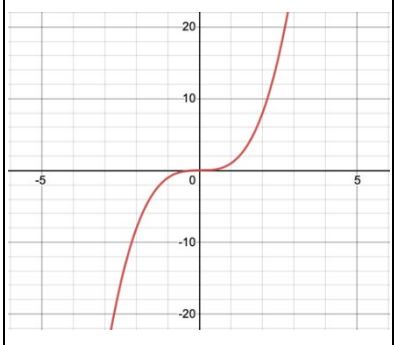
Section A

Worked Example

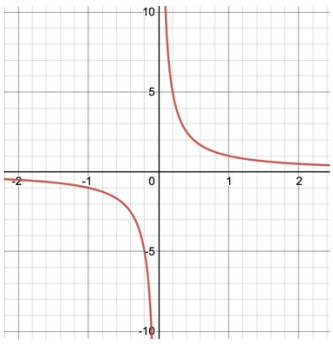
Identify the following graphs as being either linear, quadratic, cubic or reciprocal:



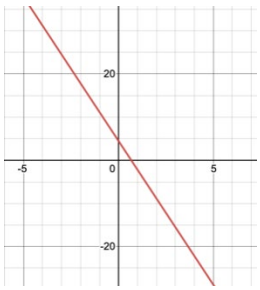
a)



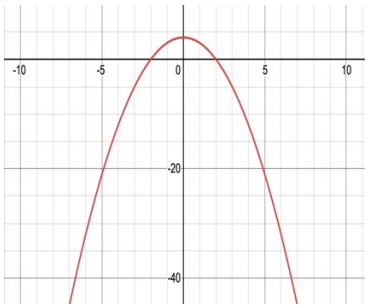
b)



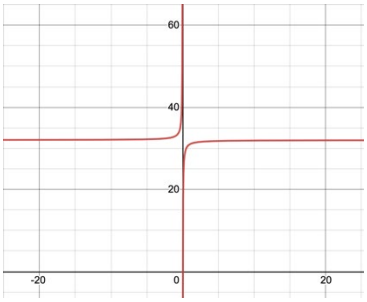
c)



d)



e)



f)

Step 1: First, identify any linear graphs. Remember, a linear graph simply looks like a straight line.

Looking at the graphs, we see that d) is the only straight line so d) is the only linear graph.

Step 2: Next, we look for quadratic graphs. Quadratics are curves that either look like 'U' shape or 'n' shape.

Looking at the given graphs, we see that a) and e) are quadratic.

Step 3: Next, identify any cubic graphs. Cubic graphs either have a point of inflection or two turning points and each end of the curve points in a different direction.

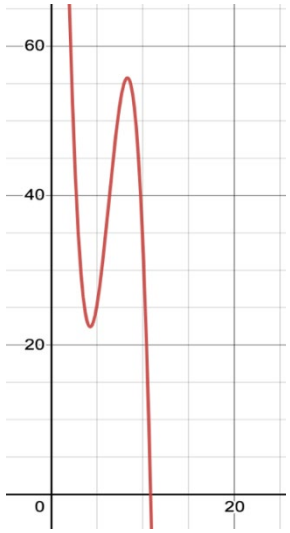
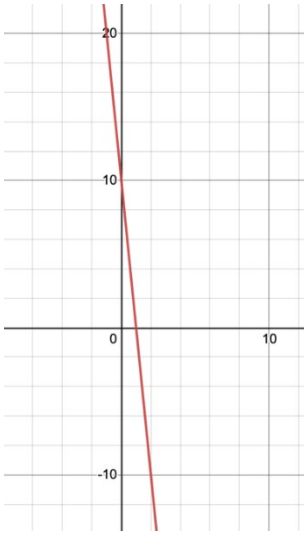
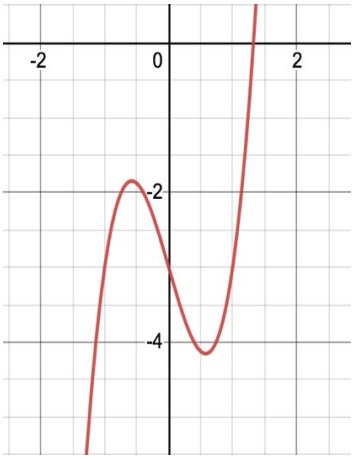
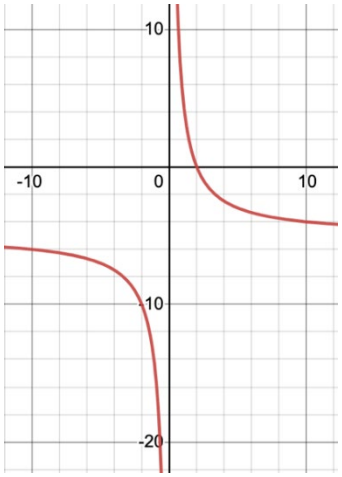
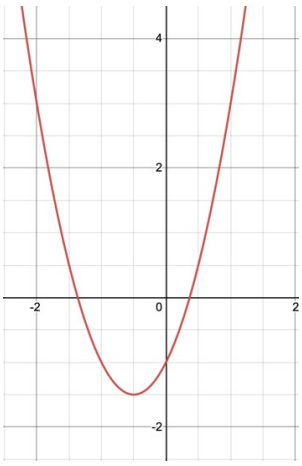
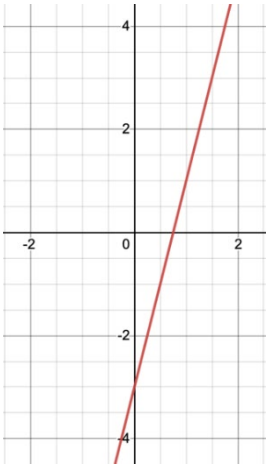
From the given graphs only b) is cubic. It has a point of inflection at the origin.

Step 4: Finally, find any reciprocal graphs. These are graphs that have discontinuity which means they have two different sections that plateau to some constant value.

The graphs of both c) and f) have two different disconnected sections, on either side of the y-axis. This means c) and f) are reciprocal graphs.

Guided Example

Identify the following graphs as being either linear, quadratic, cubic or reciprocal:

<table>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>a)</td><td>b)</td><td>c)</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>d)</td><td>e)</td><td>f)</td></tr>
</table>

Step 1: Identify the linear graphs – remember these are simply straight lines.

Step 2: Identity the quadratic graphs – the curves that are shaped like ‘∪’ or ‘∩’.

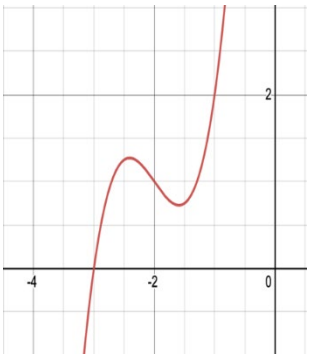
Step 3: Identify the cubic graphs – remember they either have a point of inflection or two turning points.

Step 4: Identify the reciprocal graphs – they have discontinuity which means they can usually be identified by being made up of disconnected sections of graphs.

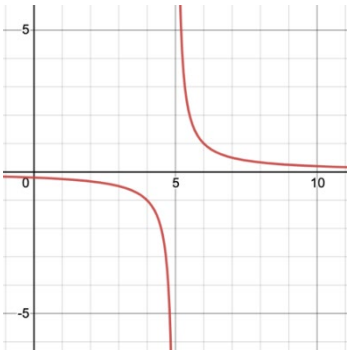
Now it's your turn!

If you get stuck, look back at the worked and guided examples.

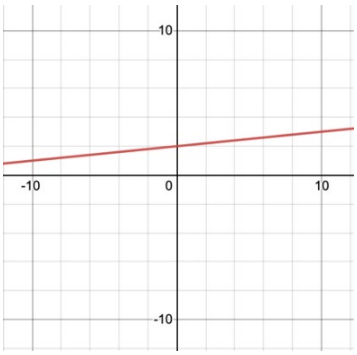
1. Identify the following graphs as being either linear, quadratic, cubic or reciprocal:



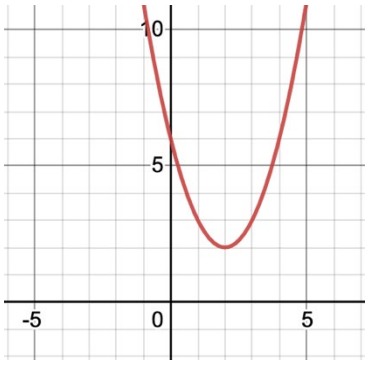
a)……..



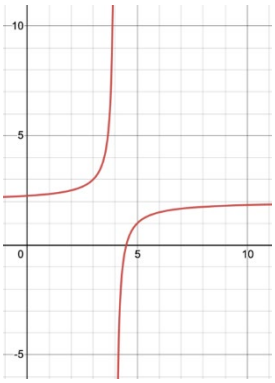
b)……..



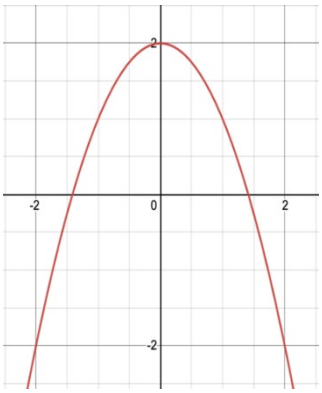
c)……..



d)……..

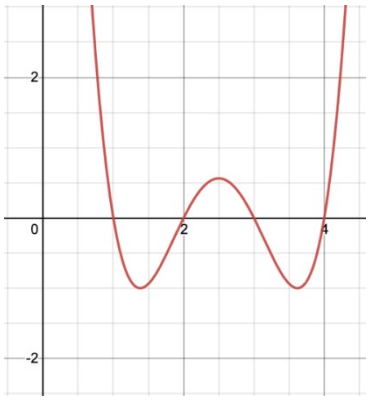


e)……..

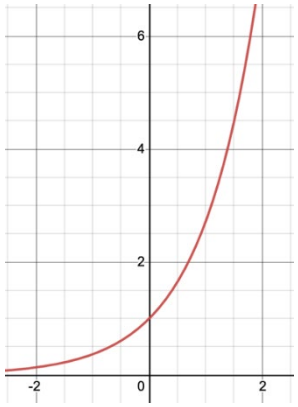


f)……..

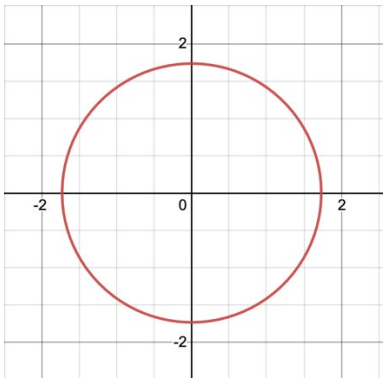
2. Out of the three following graphs, are any of them linear, quadratic, cubic or reciprocal? If not, can you suggest what type of graph they might be?



a)……..



b)……..



c)……..

Section B

Worked Example

Sketch the graph of $y = x^3 + 1$ between $x = -2$ and $x = 2$.

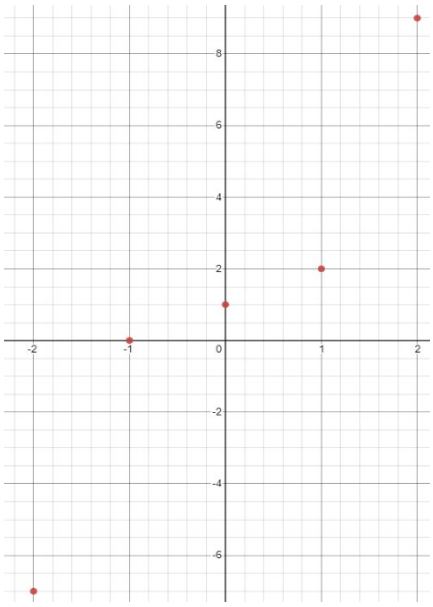
Step 1: Create a table of values for $-2 \leq x \leq 2$.

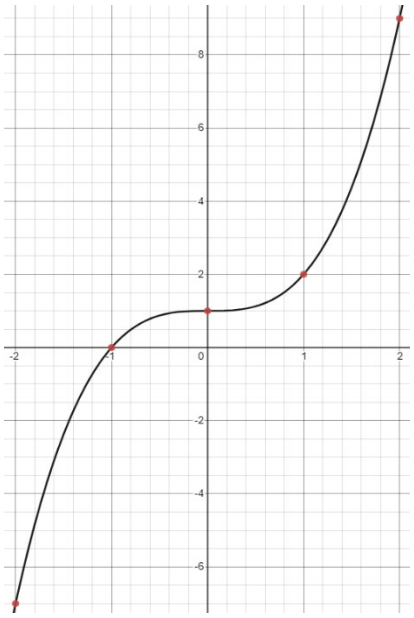
This requires substituting each value of x into the function $y = x^3 + 1$ to find the corresponding y value.

x	-2	-1	0	1	2
$y = x^3 + 1$	-7	0	1	2	9

Step 2: Plot the points given by the table of values. Then join the points up with a smooth curve.

The table of values gives the points $(-2, -7)$, $(-1, 0)$, $(0, 1)$, $(1, 2)$ and $(2, 9)$.





When drawing the curve, make sure it passes through each of the points plotted.

Try to draw the curve in one sweep of the pen – it is important that it doesn't look like a sequence of lines drawn between each coordinate points.

Guided Example

Sketch the graph of $y = \frac{1}{x}$ between $x = 1$ and $x = 10$

Step 1: Create the table of values.

Step 2: Plot the points given by the table of values. Then join the points up with a smooth curve.

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

3. Sketch the following graphs:

a) $y = 2x^2 + x + 2$ between $x = -3$ and $x = 2$.

b) $y = 3x - 6$ between $x = 0$ and $x = 5$.

c) $y = x^3 + 2x + 1$ between $x = -3$ and $x = 3$.

d) $y = 3x^3 + 2x^2 + x$ between $x = -5$ and $x = 1$.

e) $y = 5x + 3$ between $x = -10$ and $x = 10$.

f) $y = \frac{1}{x} + 2$ between $x = -5$ and $x = 5$.

g) $y = \frac{1}{2x}$ between $x = -1$ and $x = 4$.

h) $y = x^2 - 4x + 1$ between $x = -1$ and $x = 4$.