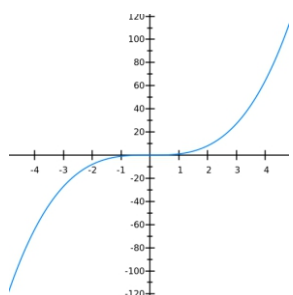

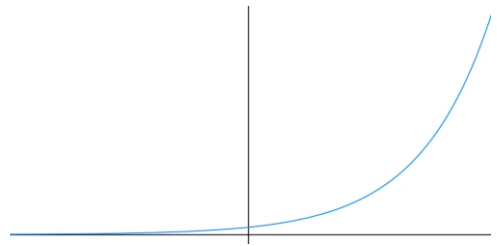
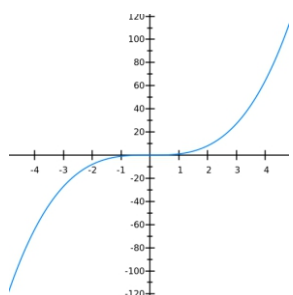

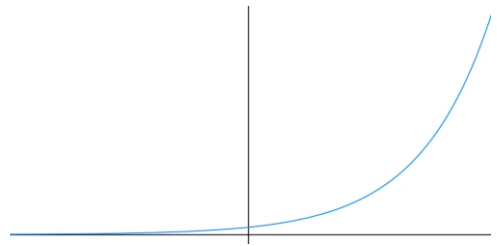
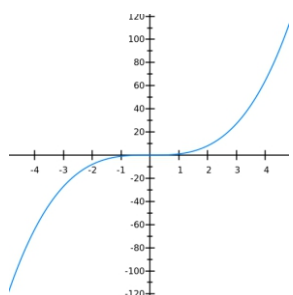

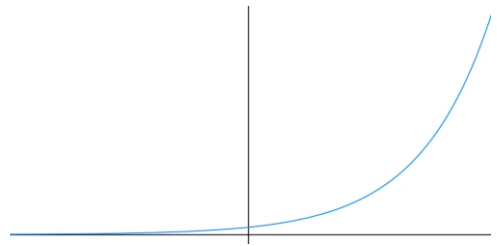


Guidance for tutors

Outcome	AG8	Student can consistently:	Draw and recognise other graphs, including cubic, reciprocal and exponential graphs.						
How the topic is examined	<div><div><input type="checkbox"/> Examined through test paper questions.</div><div><input type="checkbox"/> Questions are equally likely to appear on calculator or non-calculator papers.</div><div><input type="checkbox"/> Students are asked to either draw or recognise the shape of the following types of graphs<ul style="list-style-type: none">Cubic graphs (involves $= x^3$)Reciprocal graphs (e.g. $= \frac{1}{x}$)Exponential graphs (e.g. $= 2^x$)</div><div><input type="checkbox"/> Common questions involve being asked to complete a table of values for one of the above types of graphs and then drawing them or alternatively matching a set of equations to the correct graph.</div></div>								
Prior knowledge	<div><div><input type="checkbox"/> Students should be confident with:<ul style="list-style-type: none">Substituting into expressions (AEx5)Drawing linear graphs (AG1)Drawing quadratic graphs (AG5)</div></div>								
Suggested tuition approaches	<div><div><input type="checkbox"/> Students need to be able to recognise the shapes of the following graphs. The easiest way to do this is to get them to draw graphs of this nature.</div><div><table><tr><th>Cubic graphs</th><th>Reciprocal graphs</th><th>Exponential graphs</th></tr><tr><td><div><div>$= x^3$</div><div></div></div></td><td><div><div>$= \frac{1}{x}$</div><div></div></div></td><td><div><div>$= 2^x$</div><div></div></div></td></tr></table></div></div>			Cubic graphs	Reciprocal graphs	Exponential graphs	<div><div>$= x^3$</div><div></div></div>	<div><div>$= \frac{1}{x}$</div><div></div></div>	<div><div>$= 2^x$</div><div></div></div>
Cubic graphs	Reciprocal graphs	Exponential graphs							
<div><div>$= x^3$</div><div></div></div>	<div><div>$= \frac{1}{x}$</div><div></div></div>	<div><div>$= 2^x$</div><div></div></div>							

Guidance for tutors

	<div data-bbox="1115 276 1429 587" data-label="Figure"> </div> <ul style="list-style-type: none"> Exponential and reciprocal graphs generally look the same but shifted, students may want to draw several different cubic graphs to see how different they might look (e.g. $y = 3 + 5x^2 - 3x + 2$ and $y = 10 + 3x - 3x^3$) Students are often asked to match an equation to its graph. Graphs could also include straight lines (AG1) and quadratic graphs (AG5). It is essential that students therefore can recognise the shape of the graph. For reciprocal graphs students should realise that the graph is not continuous. For example for the graph $y = \frac{1}{x}$ you cannot find a y value is $x = 0$, this is because you cannot divide by 0 For exponential graphs, the graph continues to get steeper and steeper. If students are asked to draw a graph without the aid of a table they should always make themselves a table of values firstly.
<p>Common errors and misconceptions</p>	<ul style="list-style-type: none"> Students get the wrong values when substituting into the equation. This particularly happens with negative values. Remind students that when they square a negative value the answer is positive. Some students try to use pattern spotting to complete the values. This should be done with caution as they don't follow a linear pattern like linear graphs. Substituting into any quadratic terms can lead to a few mistakes. E.g. find $5x^2$ when $x = 2$. A common wrong answer is 100 as students multiply by 5 first and then square their answer. Instead it is only the x that is squared, so students should square 2 and then multiply by 5. If using a calculator you should put negative numbers in brackets as this often can lead to a wrong answer if they don't. For example when typing into a calculator they should use brackets around negative numbers (e.g. $(-3)^2$). A calculator would give the answer -9 if a student just typed in -3^2.

Guidance for tutors

	<ul style="list-style-type: none"> □ Students might notice that for cube numbers on a calculator they don't need a bracket for the x – value, you should still always encourage them to do so. □ Once the points are plotted, if any of the points look out of place, based on how the graph should look – students should go back and check their working. □ For reciprocal graphs there is a common mistake to try to connect the graphs through the middle as students think that when you divide by 0 you get 0. Students need to be aware that this is not the case. □ Students often get the graphs mixed up. Practice and repetition will help them overcome this.
<p>Suggested resources</p>	<ul style="list-style-type: none"> □ Questions <ul style="list-style-type: none"> ○ http://www.cimt.org.uk/projects/mepres/allgcse/pr13-sa.pdf (pp 44 – 47) ○ https://corbettmaths.files.wordpress.com/2013/02/exponential-graphs-pdf.pdf ○ https://www.tes.com/teaching-resource/quadratic-cubic-and-reciprocal-graphs-grade-b-6329057 □ Video tutorial <ul style="list-style-type: none"> ○ http://corbettmaths.com/2013/10/24/reciprocal-graphs/ ○ http://corbettmaths.com/2013/11/17/exponential-graphs/ ○ https://www.youtube.com/watch?v=bH4zaUhCp5E