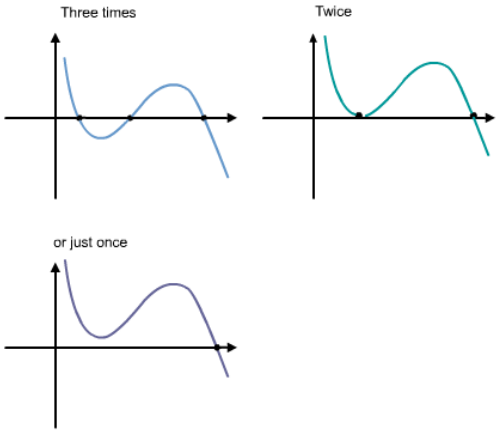
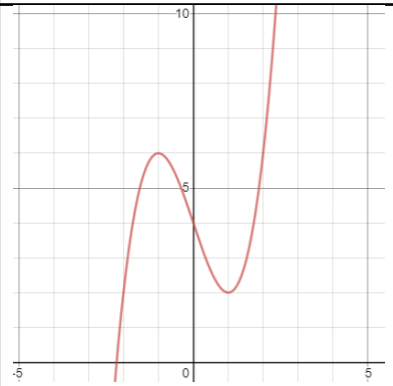
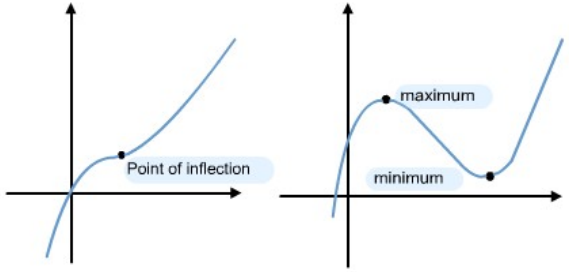
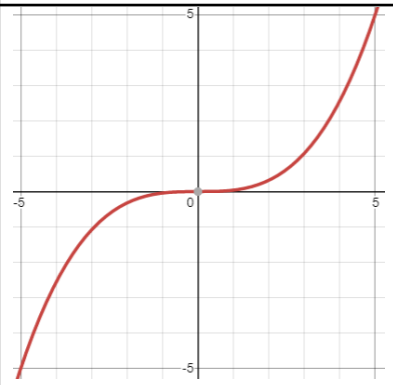
GCSE Mathematics – Unit 20: More Algebra **Name:……..**

Topic/Skill	Definition/Tips	Example	Your Turn
Cubic Function	The highest power of x in a cubic function will be **3** such as in x^3. The function can also have x^2, x and a constant present.	a) $2x^3 - x^2 + 2x - 1$ b) x^3 c) $1 - x^3$ d) $x^3 + x^2$	Which are cubic? $x^2 - x^3$ $x^3 + x^4$ $1 - 2x^2 - x^3$
Roots of a cubic function	A **root** exists where a line on a graph crosses or touches the x-axis. A **root** is the value of x at the cross or touch point. A cubic function can have one, two or three **roots**.		 How many roots does this function have?
The shape of a cubic curve	**Cubic curves** can generally take on four shapes. There can be **maximum** and **minimum** points on a cubic curve. **OR** There can be a **point of inflexion** on a cubic curve (a kind of flat region).		 How many points of inflexion does this function have?

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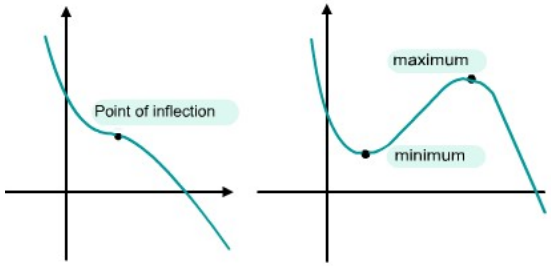
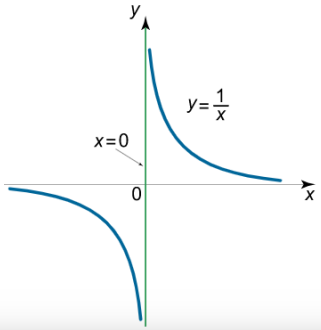
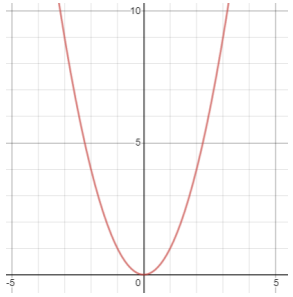
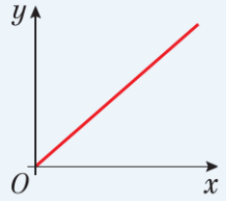
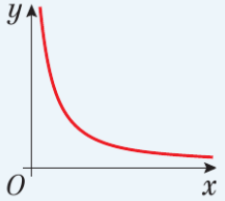
<tr><td></td><td></td><td> 
</td><td></td></tr>
<tr><td>Asymptote</td><td>The graph of the function $\frac{1}{x}$ gets closer and closer to the x-axis or y-axis but never touches them! When this occurs we call the x-axis and y-axis asymptotes.</td><td> 
</td><td>Is x^2 an asymptote?
  </td></tr>
<tr><td>Direct Proportion</td><td>When two variables, x and y, are in direct proportion then y is always equal to a constant multiplied by x. Or we say y = kx.

The graph of directly proportional variables always passes through the origin (0, 0).</td><td>When x and y are in direct proportion, $y = kx$
 
</td><td rowspan="2">Which of these sets of numbers are in direct proportion, inverse proportion, or netiher?
<table><tr><td>x</td><td>1</td><td>4</td><td>16</td></tr><tr><td>y</td><td>3</td><td>9</td><td>27</td></tr></table>
.....
<table><tr><td>x</td><td>1</td><td>4</td><td>16</td></tr><tr><td>y</td><td>2</td><td>8</td><td>32</td></tr></table>
.....
<table><tr><td>x</td><td>1</td><td>4</td><td>16</td></tr><tr><td>y</td><td>80</td><td>20</td><td>10</td></tr></table></td></tr>
<tr><td>Inverse Proportion</td><td>When two variables, x and y, are inversely proportional then the product of x and y is always constant xy = k where k is some constant.</td><td>When x and y are inversely proportional, $y = \frac{k}{x}$
 
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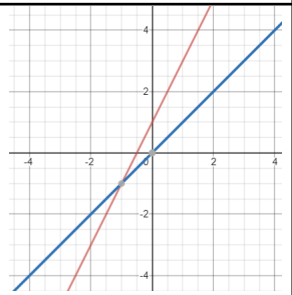
	The graph of inversely proportional variables never touch the x and x axes (asymtopes).		.....
Simultaneous Equations	Two equations involving x and y. We are look for values of x and of y that make the equations true.	E.g. $x + y = 10$ and $x - y = 18$ $y = 2$ and $y = 2x + 1$	$x = 2$ and $y = 2x + 1$ **Can you find y?**
Solving simultaneous equations graphically	We can solve simultaneous by drawing their graphs and finding the coordinates of where the lines cross or touch. This is called the point of **intersection.**	Consider $y = 2x + 1$ and $y = x$. The point of **intersection** is (-1, -1) so the solution is: $x = -1$ and $y = -1$ 	
Solving simultaneous equations algebraically	One way to solve simultaneous equations is by **eliminating** either the x or y terms.	$2x + y = 10$ [1st equation] $x + y = 8$ [2nd equation] $x = 2$ [1st - 2nd equation] y gets eliminated. We now substitute x = 2 into the 1st equation. 4 + y = 10 so y = 6	
The subject of a formula	The letter that is by itself on one side of the "=" sign in a **formula**.	y is the subject in y = mx + c C is the subject in A + B = C There is no subject for x + y = 0	
Changing the subject of a formula	You can change the **subject** of formula using inverse calculations.	If y = mx + c then we can subtract c from both sides then divide both sides by m to get. $x = \frac{y-c}{m}$	
The difference between an equation and an identity	An **equation** has an equals sign "=". It can be solved to find a value for the unknown x.	For the **equation** 2x + 1 = x – 2 has a solution of x = -3	

	An **identity** has an identity sign "≡". It is similar to an equals sign but **<u>any</u>** values of x is a solution of an identity.	For the **identity** $2(x - 1) + 2 \equiv 2x$ is an identity (if we simplify the left-hand-side we get the same as the right-hand-side). X can therefore be any value.	
Even numbers	All **even numbers** are multiples of 2. We represent even terms using: $2n$ Where n is any positive integer. Sometimes we use m.	E.g. Jason has three successive even numbers in his head. Use algegra to represent the three numbers. $2n, 2n + 2, 2n + 4$ (if n = 1 then the numbers in Jason's mind are: 2, 4, 6)	