Graphs of Derivative Functions

Wednesday, 14 March 2018 5:31 pm

By the end of teaching I would ask that you complete the following:

Graphs of derivative function	9D	1,3,4,7

RECAP:

In a previous lesson we learnt that when we differentiate at a point we are finding **the gradient of the tangent to a point.**
When we differentiate a function, we are finding a gradient function.

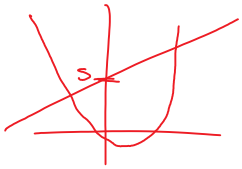
Example:

With the equation $y = 3x^2 + 5x - 4$

The gradient function is $y' = 6x + 5$

$\Rightarrow y = 3x^2 + 5x - 4$

$\Rightarrow y' = 6x + 5$



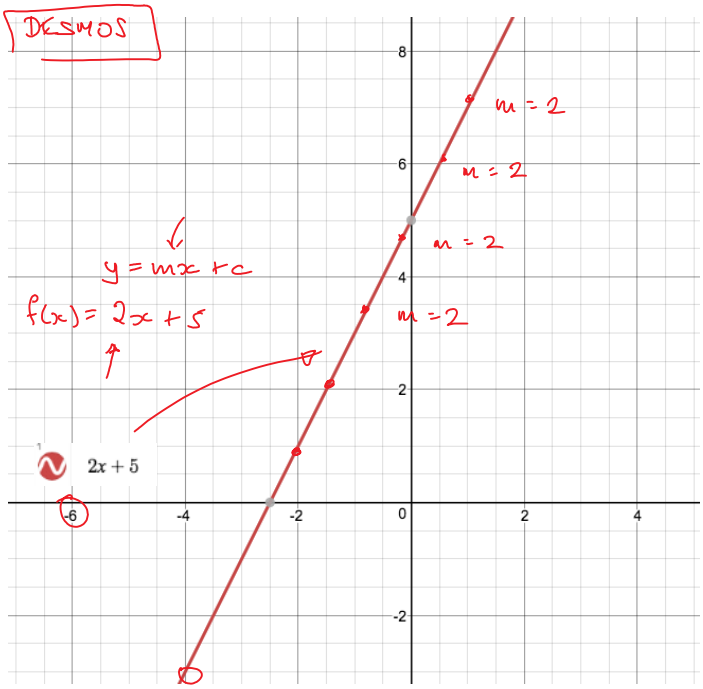
This means that we can find the gradient at any point along the curve using this formula.

To find the **gradient of the tangent at a point**, we need to be given (or consider) an x-value.

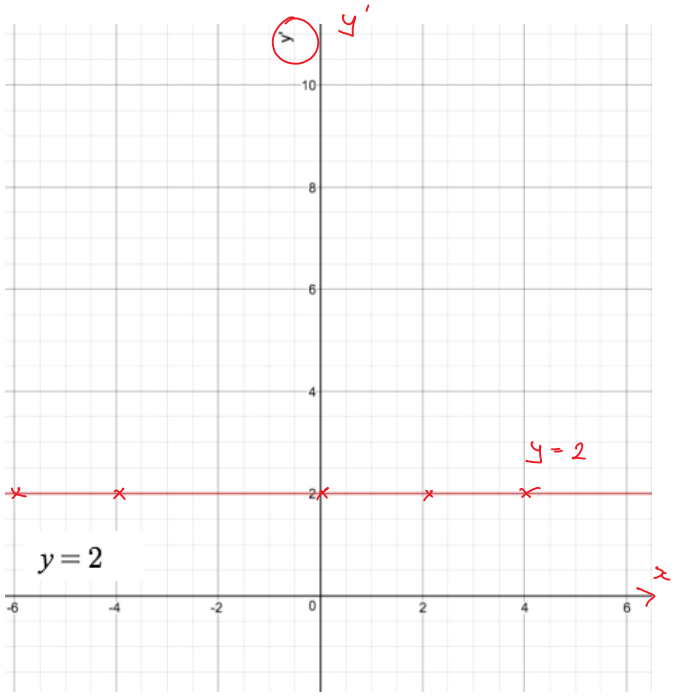
So, if, for example, we wanted to know the gradient at the point $(2, 20)$ … we only need look at the x-value (as the gradient function is only interested in the values of x) and substitute it into the gradient function.
Hence, at the point $(2, 20)$ we would know the gradient of the tangent at that point is 17.

In later sections of the course (and SACs) it's important to know that the gradient might look like.
Hence, we need to look at the graphs of derivative functions.

Basic Derivative Function



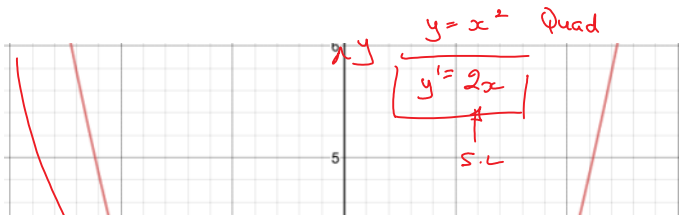
Gradient = 2 along the whole line.

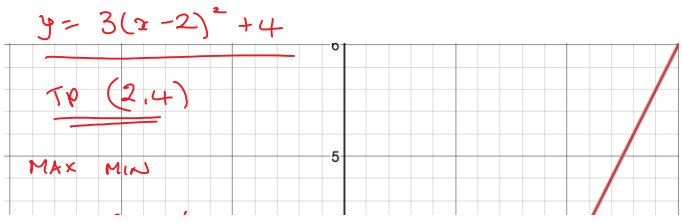


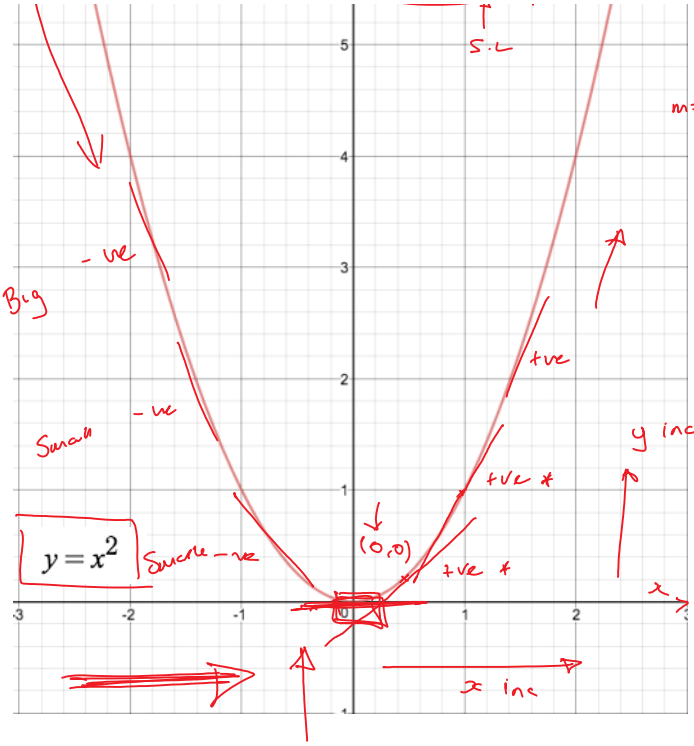
Gradient of Derivative

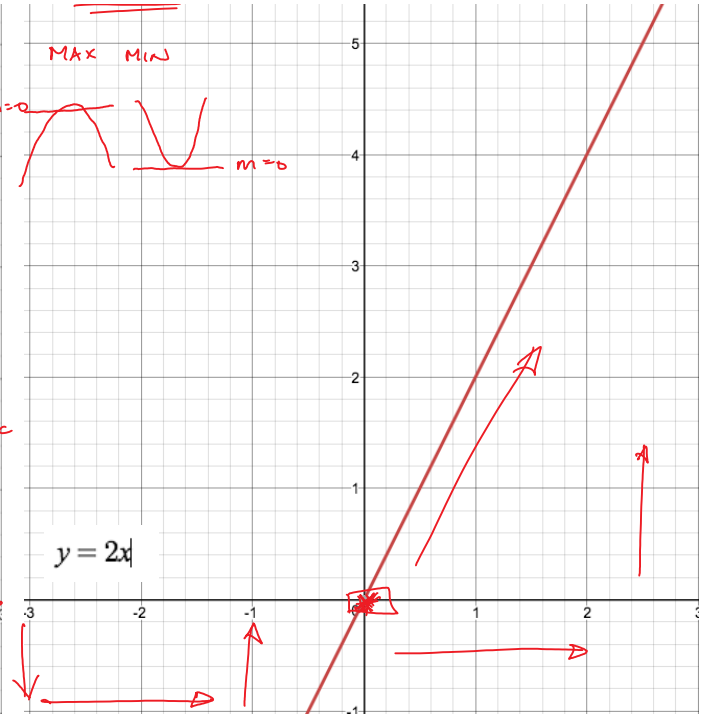
Quadratic Functions (Basic)

Turning point T.P. Form



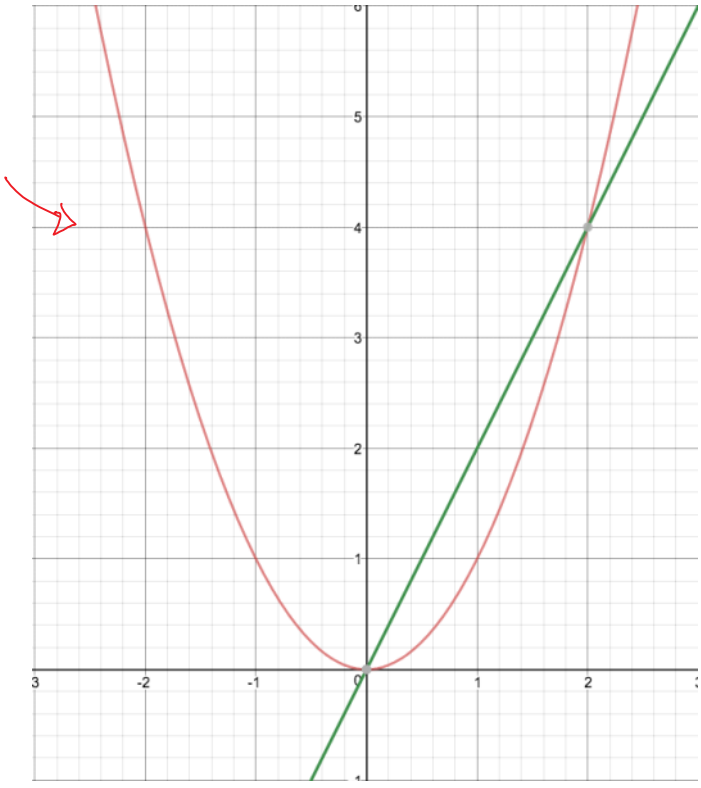




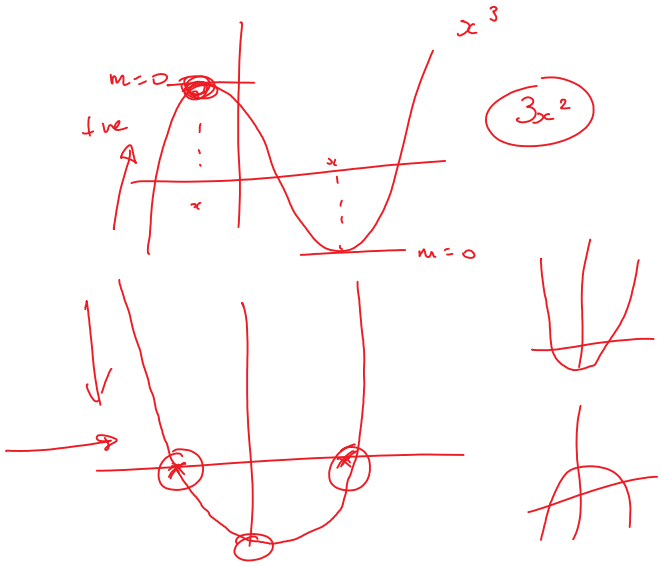


We know, when we differentiate this, the gradient function is $2x$

What happens when we start to look at them on the same graph:

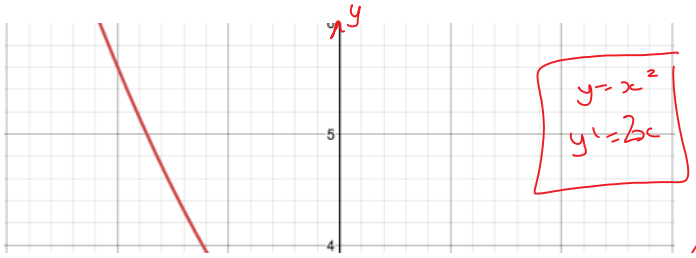


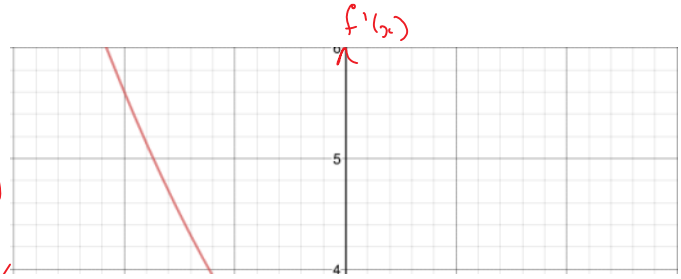
The turning points of the quadratic mark a point where there is zero gradient. These are really important points. Not just on quadratics, but cubics and quartics etc.

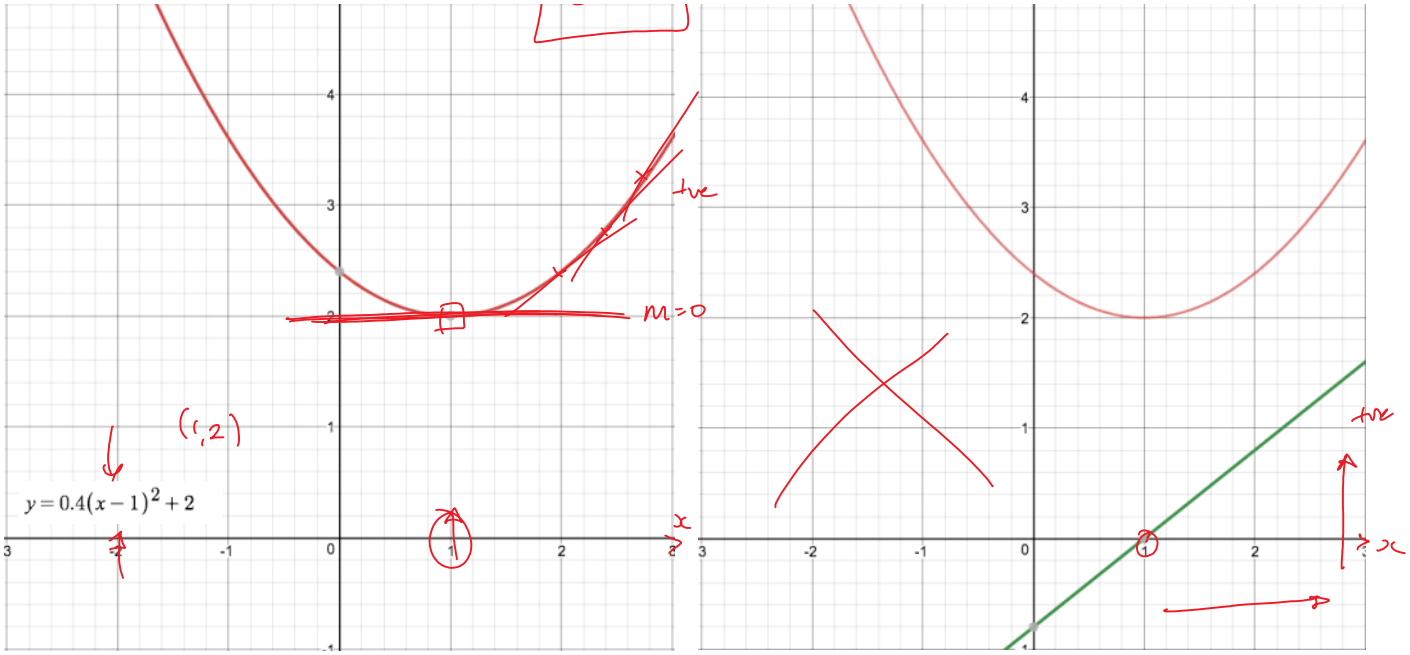


Quadratic function (more complex)

What happens when we have a more complex quadratic?

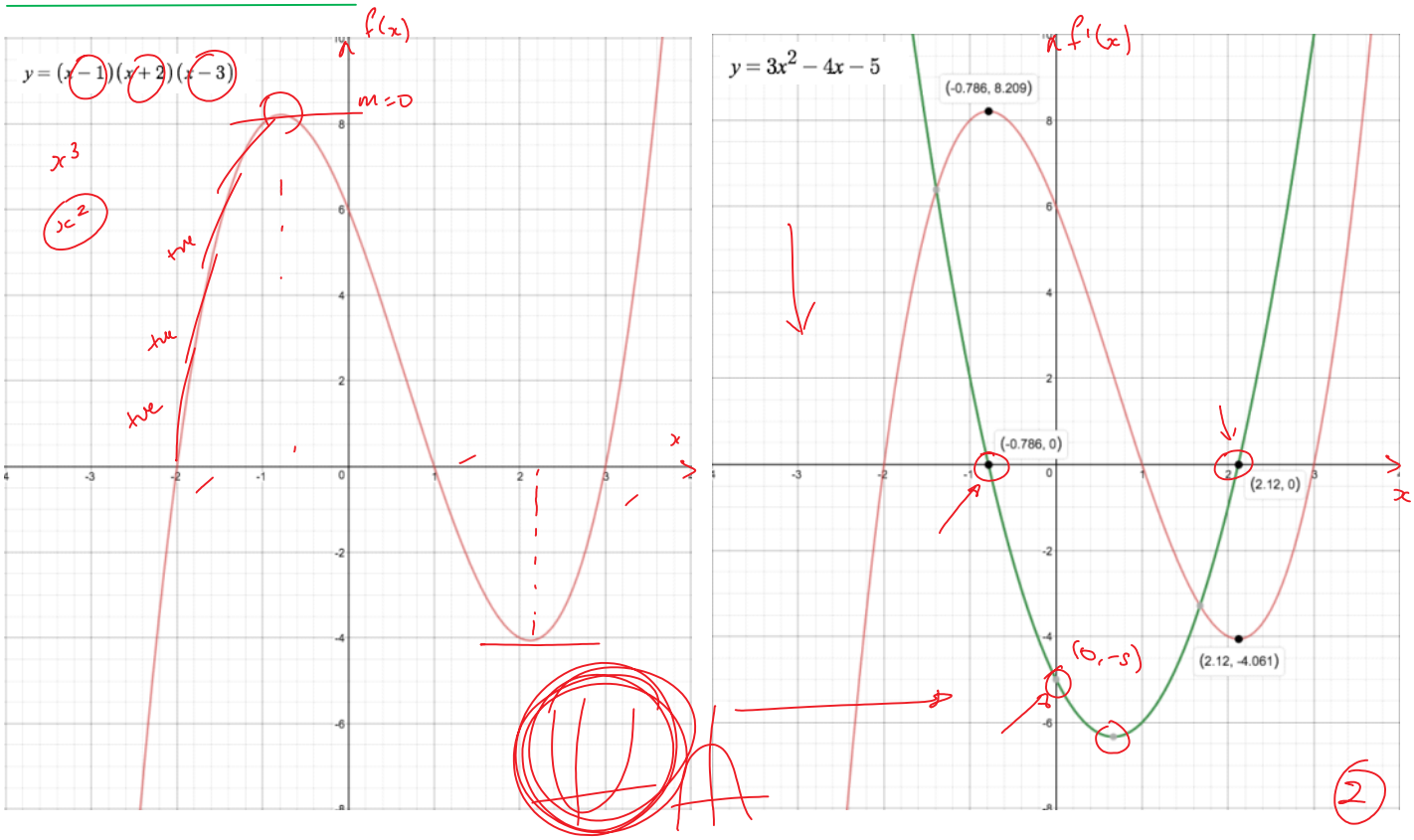






The green line shows the graph of the derivative function.
Note, again, the that turning point of the original function is a zero gradient.

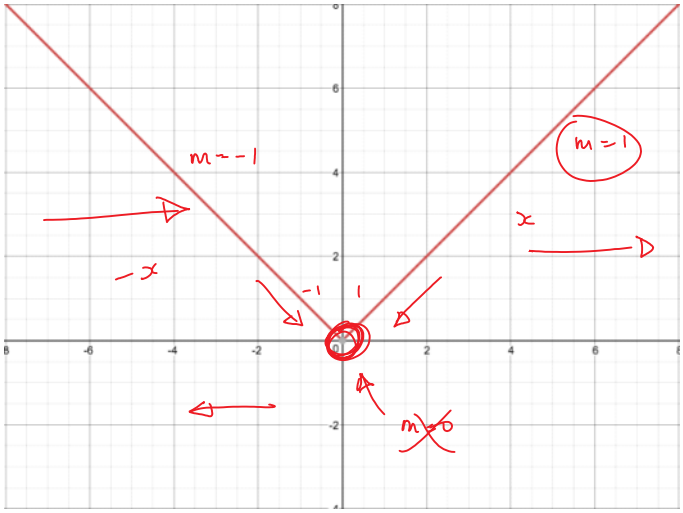
Cubic functions



Hybrid functions

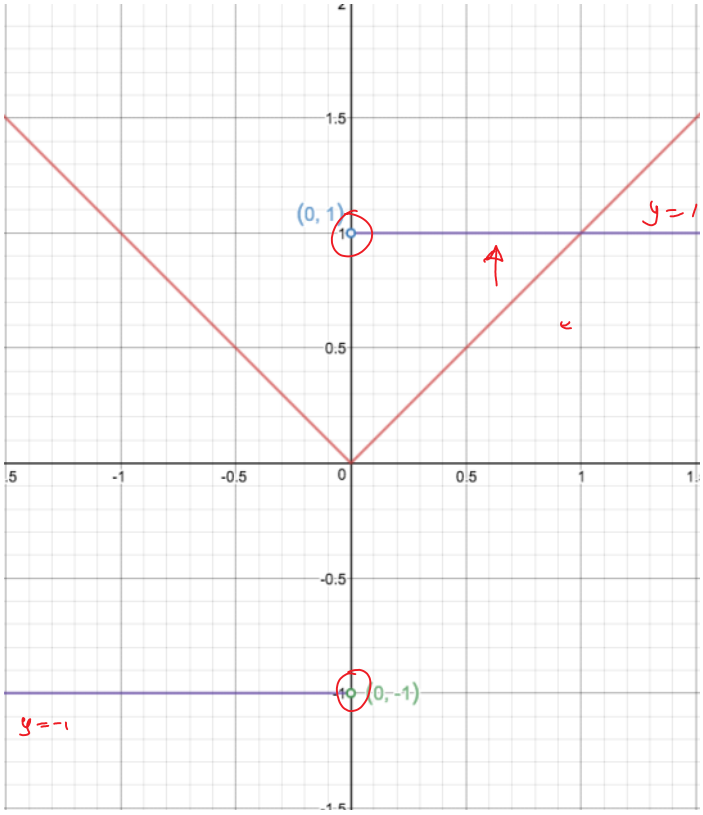
We can use the process to help us draw graphs of derivative functions for hybrids.

$y = mx + c$



This graph has equation:

$$f(x) = \begin{cases} x, & x > 0 \\ -x, & x \leq 0 \end{cases}$$



Notice that the gradient is 1 and -1.
Do you notice the open dots?
This means, at the point where $x = 0$, there is no gradient.
We say that the function is not differentiable at the point $x = 0$