

DIFFERENTIATION FROM FIRST PRINCIPLES:

The derivative function, $f'(x)$, allows you to find the gradient of the function $f(x)$ for any value of x , so long as it exists on the graph.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

As we noticed previously, by reducing “ h ” in the difference quotient, we could produce a secant line that was closer and closer to being the tangent at x . By setting a limit of $h \rightarrow 0$, we can set the two points closer and closer until the distance between the two is infinitesimally small. This is **deriving from first principles**.

10.1 WORKED EXAMPLE

Find the difference quotient of the function $y = 3x + 5$.
What is the gradient function?

10.2 WORKED EXAMPLE

Differentiate the function $f(x) = x^2$