## Differential Calculus 3 multiple 2

## Section 2.5 Second derivatives



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For any function y = f(x), the first derivative is  $\frac{dy}{dx}$  or f'(x).

If we differentiate the resulting function, we get the **second derivative**.

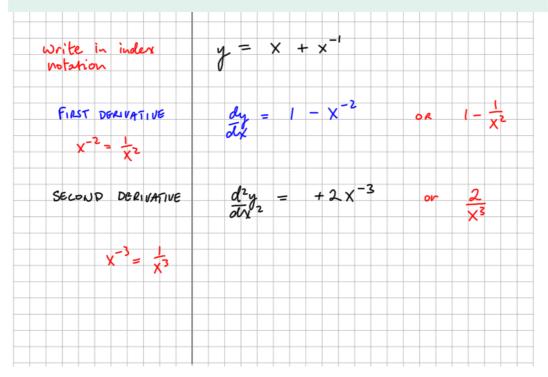
The second derivative is denoted by  $\frac{d^2y}{dx^2}$  or f''(x).

 $\frac{d^2y}{dx^2}$  is pronounced 'dee two y dee x squared'.

We learned earlier that for any function y = f(x),  $\frac{dy}{dx}$  represents the slope of the tangent to the curve at any point on the curve. When dealing with the graphs of functions in the next chapter, we will see that  $\frac{d^2y}{dx^2}$  gives the rate at which the slope is changing over a given interval.

## **Example 1**

Given that 
$$y = x + \frac{1}{x}$$
, find  $\frac{d^2y}{dx^2}$ .



## **Example 2**

If 
$$y = \frac{3}{x} + 4x$$
, find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$ ; hence, show that  $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = 0$ .

