FIRST PRINCIPLES

First Principles is used to find the slope of the tangent at any given point. It is a formula that shows the first derivative, a function that represents the gradient (slope) of another function.

FIND THE FIRST DERVIATIVE OF f(x)= x^2+5x+6 AND HENCE, THE f'(3)

$$f(x) = x^2 + 5x + 6$$
$$f'(x) = \lim_{h->0} \frac{f(x+h) - f(x)}{h}$$

Substitute values into the equation, the f(x+h) simply means that wherever there is an x, it is replaced by an x+h. This is based on the idea of using the common slope formula and some distance between two points, x and an x+h value, where h is approaching a distance of 0.

$$f'(x) = \lim_{h->0} \frac{(x+h)^2 + 5(x+h) + 6 - x^2 - 5x - 6}{h}$$

Expand the bracketed terms using law of expansion x^2+2xh+h^2 can be expanded from $(x+h)^2$

$$f'(x) = \lim_{h->0} \frac{x^2 + 2xh + h^2 + 5x + 5h + 6 - x^2 - 5x - 6}{h}$$

Terms are then simplified. All terms without a h should cancel.

$$f'(x) = \lim_{h->0} \frac{2xh + h^2 + 5h}{h}$$

We can not let h=0 yet, as this would result in the denominator being 0, hence we must isolate all h values from the numerator.

$$f'(x) = \lim_{h->0} \frac{h(2x + h + 5)}{h}$$

Then h can go to zero and there is our answer

$$f'(x) = 2x + 5$$

This means that 2x+5 represents the slope of the original function