NallPro® Education Centre
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1st Derivative Function – 01 www.NallPro.com **Name:**

The **derivative of f at the number a** is given by $f'(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$, provided that this limit exists.

Example: **(a)** Find the derivative of $f(x) = x^2$ from first principles.
(b) And determine the slopes of the tangents to the parabola $y = x^2$ at $x = -2$

(a)
$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$
$$= \lim_{h\to 0} \frac{(x+h)^2 - x^2}{h}$$
$$= \lim_{h\to 0} \frac{x^2 + 2hx + h^2 - x^2}{h}$$
$$= \lim_{h\to 0} \frac{h(2x+h)}{h}$$
$$= \lim_{h\to 0} (2x+h)$$
$$= 2x$$

(b) $f'(x) = 2x$, $x = -2$
$f'(-2) = -4$
The slopes is -4 at $x = -2$

Find the derivative of from first principles, given f(x).

1) $f(x) = 3$	**2)** $f(x) = 4x$	**3)** $f(x) = 2x^3$
4) $f(x) = x^3 + 2x^2 + 1$	**5)** $f(x) = \sqrt{ax^2 + b}$	**6)** $f(x) = \frac{1}{\sqrt{3x}}$
7) $f(x) = \frac{x+1}{x-1}$	**8)** $f(x) = \frac{1}{x^3}$	**9)** $f(x) = 2x + \frac{1}{x^2}$

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