Compute the derivative of $f(x) = 6x^2 + 10x + 3$

1) Using the formal definition in which $\lim\limits_{\Delta x \to 0}$

The formal definition is

$$\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} =$$

$$\lim_{\Delta x \to 0} \frac{\left[6(x+\Delta x)^2 + 10(x+\Delta x) + 3\right] - \left[6x^2 + 10x + 3\right]}{\Delta x} =$$

$$\lim_{\Delta x \to 0} \left\{ \frac{6\left(x^2 + 2x\Delta x + (\Delta x)^2\right) + 10(x+\Delta x) + 3 - 6x^2 - 10x - 3}{\Delta x} \right\} =$$

Collect terms, then cancel where applicable

$$\lim_{\Delta x \to 0} \left\{ \frac{\cancel{6x^2} + 12x\Delta x + 6(\Delta x)^2 + \cancel{10x} + 10\Delta x + \cancel{3} - \cancel{6x^2} - \cancel{10x} - \cancel{3}}{\Delta x} \right\} =$$

Divide by Δx

$$\lim_{\Delta x \to 0} \left\{ 12x + 6\Delta x + 10 \right\}$$

Apply $\lim_{\Delta x \to 0}$

$$\lim_{\Delta x \to 0} \left\{ 12x + \underbrace{6\Delta x}_{0} + 10 \right\}$$

Which gives the final result

$$\boxed{f'(x) = \frac{df(x)}{dx} = 12x + 10}$$

Compute the derivative of $f(x) = 6x^2 + 10x + 3$ using the shortcut

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$f'(x) = \frac{df(x)}{dx} = (2)\,6x^{2-1} + (1)\,10x^{1-1}$$

$x^0 = 1$

$$\boxed{f'(x) = \frac{df(x)}{dx} = 12x + 10}$$

Compute $f'(x)$ at $x = -0.3$

$$f'(-0.3) = 12(-0.3) + 10 = \boxed{6.4}$$