(1) $\frac{2}{3}x^3 + 2x^2 + 3x \quad = 2x^2 + 4x + 3$

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x-\Delta x) - f(x)}{\Delta x} = \lim_{\Delta x \to 0} \frac{\frac{2}{3}(x+\Delta x)^3 + 2(x+\Delta x)^2 + 3(x+\Delta x) - (\frac{2}{3}x^3 + 2x^2 + 3x)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{\cancel{\frac{2}{3}x^3} + 2x^2\Delta x + 2x\Delta x^2 + \Delta x^3 + \cancel{2x^2} + 4x\Delta x + \Delta x^2 + \cancel{3x} + 3\Delta x - \cancel{\frac{2}{3}x^3} - \cancel{2x^2} - \cancel{3x}}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{\cancel{\Delta x}[2x^2 + 2x\Delta x + \Delta x^2 + 4x + \Delta x + 3]}{\cancel{\Delta x}} = \lim_{\Delta x \to 0} 2x^2 + 2x\Delta x + \Delta x^2 + 4x + \Delta x + 3$$

$$= 2x^2 + 4x + 3 \quad \#$$

(2)

(a) $f'(x) = 2x^{\frac{3}{5}} - 3$

(b) $f'(x) = \frac{1}{7} x^{-\frac{6}{7}} = \frac{1}{7\sqrt[7]{x^6}}$

(3)

(a)

$$f'(x) = [6x\cos x - 3x^2 \sin x] - [5\sin x + 5x\cos x]$$

$$= x\cos x - 3x^2 \sin x - 5\sin x \quad \#$$

(b)

$$f'(x) = \frac{2\sin x \cos x (2x) - \sin^2 x \times 2}{(2x)^2} = \frac{4x \sin x \cos x - 2\sin^2 x}{4x^2} = \frac{2x \sin x \cos x - \sin^2 x}{2x^2}$$