

4. Given that

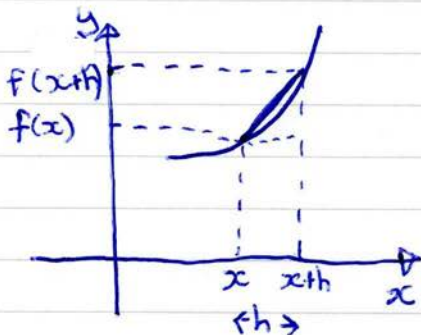
$$y = 2x^2$$

use differentiation from first principles to show that

$$\frac{dy}{dx} = 4x$$

(3)

$$\frac{dy}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$



$$= \lim_{h \rightarrow 0} \frac{2(x+h)^2 - 2x^2}{h} \quad (1 \text{ mark})$$

$$= \lim_{h \rightarrow 0} \frac{2(x^2 + 2hx + h^2) - 2x^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{2x^2 + 4hx + 2h^2 - 2x^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{4hx + 2h^2}{h} \quad (1 \text{ mark})$$

$$= \lim_{h \rightarrow 0} 4x + 2h$$

$$= 4x \quad (1 \text{ mark})$$