FIRST PRINCIPLE OF DIFFERENTIATION

2 Use the result $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ to find:

(a) $f'(-2)$ when $f(x) = x^2$

(b) $f'(-1)$ when $f(x) = x^3$

FIRST PRINCIPLE OF DIFFERENTIATION

3 $P(1,1)$ and $Q(2,8)$ are points on the curve $f(x)=x^3$. Indicate whether each statement is correct or incorrect.

(a) Gradient of $PQ=7$ **(b)** $f'(2)=\lim\limits_{x\to 1}\dfrac{x^3-8}{x-2}$ **(c)** $f'(1)=\lim\limits_{x\to 1}\dfrac{x^3-1}{x-1}$ **(d)** $f'(x)=3x^2$

FIRST PRINCIPLE OF DIFFERENTIATION

5 For the function $f(x) = 2x^2 - 4x$, find the following:

(a) $\lim_{h \to 0} \frac{f(3+h) - f(3)}{h}$ **(b)** $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

Interpret your results geometrically.

FIRST PRINCIPLE OF DIFFERENTIATION

6 Find $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ for the following:

(a) $f(x)=4x^2-1$

(c) $f(x)=x^3-2x^2$

d) $f(x) = x^3 + 4x + 5$

FIRST PRINCIPLE OF DIFFERENTIATION

e) $f(x) = x^4$

You will need to use the expansion $(x + h)^4 = x^4 + 4x^3h + 6x^2h^2 + 4xh^3 + h^4$