Let $f(x) = \frac{(3x-2)^2}{x^3}$ $, x \neq 0$

Find $f'(x)$

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

$$f(x) = \frac{g(x)}{h(x)}$$

$$f'(x) = \frac{h(x)g'(x) - h'(x)g(x)}{[h(x)]^2}$$

$$g(x) = (3x-2)^2 \qquad h(x) = x^3$$

$$\frac{d}{dx}[f(x)]^n = n \cdot f'(x) \cdot [f(x)]^{n1}$$

$$g'(x) = 2 \cdot 3(3x-2)^1 \qquad h'(x) = 3x^2$$

$$g'(x) = 6(3x-2)$$

$$f'(x) = \frac{h(x)g'(x) - h'(x)g(x)}{[h(x)]^2}$$

$$f'(x) = \frac{x^3 \cdot 6(3x-2) - 3x^2(3x-2)^2}{[x^3]^2}$$

$$f'(x) = \frac{6x^3(3x-2) - 3x^2(3x-2)^2}{x^6}$$

Factorise

$$f'(x) = \frac{3x^2(3x-2) \cdot 2x - 3x^2(3x-2)(3x-2)}{x^6}$$

$$f'(x) = \frac{3x^2(3x-2)\big(2x - (3x-2)\big)}{x^6}$$

$$f'(x) = \frac{3x^2(3x-2)(2x-3x+2)}{x^6}$$

$$f'(x) = \frac{3x^2(3x-2)(-x+2)}{x^6}$$

Since $x \neq 0$

$$f'(x) = \frac{3(3x-2)(-x+2)}{x^4}$$