

The Power and Product Rules

Differentiate $h(x) = (x-1)(3x+2)$, a) using the power rule and
b) using the product rule.

$$\begin{aligned} \text{a) } h(x) &= 3x^2 - 3x + 2x - 2 \\ &= 3x^2 - x - 2 \end{aligned}$$

$$\begin{aligned} h'(x) &= 2 \cdot 3x - 1 - 0 \\ &= 6x - 1. \end{aligned}$$

$$\begin{aligned} \text{b) Let } f(x) &= x - 1 \\ g(x) &= 3x + 2 \end{aligned}$$

Then

$$h(x) = f(x)g(x)$$

$$h'(x) = f(x) \frac{d}{dx} g(x) + g(x) \frac{d}{dx} f(x)$$

$$= (x-1) \frac{d}{dx} (3x+2) + (3x+2) \frac{d}{dx} (x-1)$$

$$= (x-1)(3) + (3x+2)(1)$$

$$= 3x - 3 + 3x + 2$$

$$\underline{\underline{h'(x) = 6x - 1}}$$

Power Rule:

If n is any real number, then
 $\frac{d}{dx} (x^n) = nx^{n-1}$.

Product Rule:

If f and g are differentiable,
 $\frac{d}{dx} [f(x)g(x)] = f(x) \frac{d}{dx} g(x) + g(x) \frac{d}{dx} f(x)$

not required