

1. Differentiate each of the following functions with respect to x . Do not simplify.

(a) $f(x) = \pi x$

$$f'(x) = \pi$$

(b) $f(x) = 700$

$$f'(x) = 0$$

(c) $f(x) = \frac{1}{x^8}$

Rewrite as $f(x) = x^{-8}$

$$f'(x) = -8x^{-9} \text{ or } -\frac{8}{x^9}$$

(d) $f(x) = \sqrt[6]{x}$

Rewrite as $f(x) = x^{1/6}$

$$f'(x) = \frac{1}{6}x^{-5/6} \text{ or } \frac{1}{6x^{5/6}}$$

(e) $f(x) = -18x^2 + 15x^{7/5}$

$$f'(x) = -36x + 15 \cdot \frac{7}{5}x^{2/5}$$

$$f'(x) = -36x + 21x^{2/5}$$

(f) $f(x) = (x^3 - 3x + 1)(x^7 + 2)$ **Use Product Rule**

$$\begin{aligned} f'(x) &= (x^3 - 3x + 1) \cdot \frac{d}{dx}[x^7 + 2] + (x^7 + 2) \cdot \frac{d}{dx}[x^3 - 3x + 1] \\ &= (x^3 - 3x + 1)(7x^6) + (x^7 + 2)(3x^2 - 3x) \end{aligned}$$

If you simplify, you get

$$\begin{aligned} f'(x) &= 7x^9 - 21x^7 + 7x^6 + 3x^9 - 3x^7 + 6x^2 - 6 \\ &= 10x^9 - 24x^7 + 7x^6 + 6x^2 - 6 \end{aligned}$$

(g) $f(x) = \frac{x^2 - 3x}{x - 1}$. Use **Quotient Rule**

$$\begin{aligned} f'(x) &= \frac{(x-1) \cdot \frac{d}{dx}[x^2 - 3x] - (x^2 - 3x) \cdot \frac{d}{dx}[x - 1]}{(x-1)^2} \\ &= \frac{(x-1)(2x-3) - (x^2 - 3x)(1)}{(x-1)^2} \end{aligned}$$

If you simplify, you get the following

$$\begin{aligned} f'(x) &= \frac{2x^2 - 3x - 2x + 3 - x^2 + 3x}{(x-1)^2} \\ &= \frac{x^2 - 2x + 3}{(x-1)^2} \end{aligned}$$