
Complete the following problems. Show all work to receive full credit.

1. Find $\frac{d}{dx} \left(\frac{4x^3}{3} - x \right)$.

$$\begin{aligned} &= \frac{d}{dx} \left(\frac{4}{3}x^3 - x \right) \\ &= \frac{4}{3} \cdot 3x^2 - 1 \\ &= 4x^2 - 1 \end{aligned}$$

2. Find $\frac{d}{dx} \left(\frac{1}{x} + \sqrt{x} + e \right)$.

$$\begin{aligned} &= \frac{d}{dx} \left(x^{-1} + x^{\frac{1}{2}} + e \right) \\ &= -x^{-2} + \frac{1}{2}x^{-\frac{1}{2}} + 0 \\ &= -\frac{1}{x^2} + \frac{1}{2\sqrt{x}} \end{aligned}$$

3. Find $\frac{d}{dx} ((x-1)(x^2-x+3x^3))$.

$$= 1(x^2 - x + 3x^3) + (2x - 1 + 9x^2)(x - 1)$$

4. Find $\frac{d}{dx} \left(\frac{x^3 + 7}{x + 4} \right)$.

$$\begin{aligned} &= \frac{3x^2(x+4) - 1(x^3+7)}{(x+4)^2} \\ &= \frac{3x^3 + 12x^2 - x^3 - 7}{(x+4)^2} \\ &= \frac{2x^3 + 12x^2 - 7}{(x+4)^2} \end{aligned}$$