

2.3 - Differentiation Formulas

2.3a

$$\frac{d}{dx}(c) = 0 \text{ (The derivative of a constant function)}$$

$$\frac{d}{dx}(x^n) = nx^{n-1}, \quad n \in \mathbb{R} \text{ (The Power Rule)}$$

2.3b

$$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x) \text{ (The Sum and Difference Rules)}$$

$$\frac{d}{dx}[cf(x)] = cf'(x) \text{ (The Constant Multiple Rule)}$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + f'(x)g(x) \text{ (The Product Rule)}$$

$$\text{OR } (uv)' = u'v + uv'$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2} \text{ (The Quotient Rule)}$$

$$\text{OR } \left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$$

2.3c

Exercises:

Differentiate the function (aka find the derivative of the function).

$$f(x) = 60x^4 - \frac{8}{3}x^3 + \frac{10}{3x^{1/3}} + 2$$

$$f(x) = \sqrt{x}$$

2.3d

$$B(x) = (x^3 + 1)(2x^2 - 4x - 1)$$

$$y = \frac{(u + 2)^2}{1 - u}$$

2.3e

Proofs:

The Product Rule

The Quotient Rule