Product Rule

$$[f(x) + g(x)]' = f'(x) + g'(x)$$

$$[f(x) - g(x)]' = f'(x) - g'(x)$$

$$[f(x) \cdot g(x)]' \neq f'(x) \cdot g'(x)$$

is diffrenent from

Here is the product rule:

$$[f(x) \cdot g(x)]' = f'(x) \cdot g(x) + g'(x) \cdot f(x)$$

Example: Find $f'(x)$

$$f(x) = \underbrace{(x^2 + x)} \cdot (x^3 + 2)$$

$$f'(x) = (x^2 + x)' \cdot (x^3 + 2) + (x^3 + 2)' \cdot (x^2 + x)$$

$$= (2x + 1)(x^3 + 2) + (3x^2) \cdot (x^2 + x)$$

simplifying

$$= 2x^4 + 4x + x^3 + 2 + 3x^4 + 3x^3$$

$$= \boxed{5x^4 + 4x^3 + 4x + 2}$$

Example: Find $f'(x)$

$$f(x) = (2x + \sqrt{x}) \cdot (3\sqrt[4]{x} + \frac{1}{x})$$

product rule

$$f'(x) = (2x + \sqrt{x})' \cdot (3\sqrt[4]{x} + \frac{1}{x}) + (3\sqrt[4]{x} + \frac{1}{x})' \cdot (2x + \sqrt{x})$$

rewrite

$$= (2x + x^{1/2})' (3\sqrt[4]{x} + \frac{1}{x}) + (3x^{1/4} + x^{-1})' (2x + \sqrt{x})$$

$$= (2 + \frac{1}{2} x^{1/2 - 1}) (3\sqrt[4]{x} + \frac{1}{x}) + (3 \cdot \frac{1}{4} x^{1/4 - 1} - 1 \cdot x^{-1-1}) (2x + \sqrt{x})$$

$$= (2 + \frac{1}{2} x^{-1/2}) (3\sqrt[4]{x} + \frac{1}{x}) + (\frac{3}{4} \cdot x^{-3/4} - x^{-2}) (2x + \sqrt{x})$$

Assignment 14 – Part 1

Find $f'(x)$.

1. $f(x) = (x^2 + 3x + 1) \cdot (x^3 + 4x^2 + 6)$

2. $f(x) = (3\sqrt{x} + \frac{1}{x^2}) (\sqrt[3]{x} - \frac{6}{x^3} + 7)$