Product and Quotient Rules

Product Rule

$$\frac{d}{dx}\left[\, f\, g\, h \,\right] = f'\, g\, h + f\, g'\, h + f\, g\, h'$$

Quotient Rule

$$\frac{d}{dx}\left[\, \frac{f}{g} \,\right] = \frac{f'\, g \;-\; f\, g'}{g^2}$$

Tangent Line

Tangent line to $f(x)$ at $x = a$

$$y = f(a) \;+\; f'(a)\,(x - a)$$

1. (Product Rule) Compute derivatives using the indicated method.

MULTIPLY FIRST

A1. $f(x) = x^3\, x^2$

B1. $f(x) = x\,\sqrt{x}$

C1. $f(x) = (3x + 1)\,(2x - 3)$

PRODUCT RULE

A2. $f(x) = x^3\, x^2$

B2. $f(x) = x\,\sqrt{x}$

C2. $f(x) = (3x + 1)\,(2x - 3)$

2. (Quotient Rule) Compute derivatives using the indicated method.

DIVIDE FIRST

A1. $f(x) = \dfrac{x^5}{x^2}$

B1. $f(x) = \dfrac{x}{\sqrt{x}}$

C1. $f(x) = \dfrac{x^2 + 1}{x}$

QUOTIENT RULE

A2. $f(x) = \dfrac{x^5}{x^2}$

B2. $f(x) = \dfrac{x}{\sqrt{x}}$

C2. $f(x) = \dfrac{x^2 + 1}{x}$

3. (Product Rule) Consider $f(x) = (x^3 + x^2)(x^2 + x)(4x - 1)$.

A. Compute the derivative.

B. Find the tangent line at $x = 1$.

4. (Quotient Rule) Consider $f(x) = \dfrac{x^2 + 3}{x^3 + \sqrt{x}}$.

A. Compute the derivative.

B. Find the tangent line at $x = 1$.