

## Quotient Rule Practice

Find the derivatives of the following rational functions.

a)  $\frac{x^2}{x+1}$

b)  $\frac{x^4 + 1}{x^2}$

c)  $\frac{\sin(x)}{x}$

Quotient Rule

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

$$\textcircled{a} \quad \frac{d}{dx} \left( \frac{x^2}{x+1} \right) = \frac{2x(x+1) - x^2(1)}{(x+1)(x+1)} \\ = \frac{2x^2 + 2x - x^2}{x^2 + 2x + 1}$$

$$\frac{d}{dx} \left( \frac{x^2}{x+1} \right) = \frac{x^2 + 2x}{x^2 + 2x + 1} \quad \text{or} \quad \frac{x^2 + 2x}{(x+1)^2}$$

$$\textcircled{c} \quad \frac{d}{dx} \left( \frac{\sin x}{x} \right) = \frac{x \cos x - \sin x(1)}{x^2}$$

$$\frac{d}{dx} \left( \frac{\sin x}{x} \right) = \frac{x \cos x - \sin x}{x^2}$$

$$\textcircled{b} \quad \frac{d}{dx} \left( \frac{x^4 + 1}{x^2} \right) = \frac{4x^3(x^2) - 2x(x^4 + 1)}{x^4}$$

$$= \frac{4x^5 - 2x^5 - 2x}{x^4} \\ = \frac{x(4x^4 - 2x^4 - 2)}{x^4}$$

$$\frac{d}{dx} \left( \frac{x^4 + 1}{x^2} \right) = \frac{2x^4 - 2}{x^3}$$

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