$$\frac{d\left(\frac{u}{v}\right)}{dx} = \frac{\frac{du}{dx}v - u\frac{dv}{dx}}{v^2}$$

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Quotient Rule Practice

Find the derivatives of the following rational functions.

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

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

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

a) $\dfrac{dy}{dx} = \dfrac{2x(x+1) - x^2(1)}{(x+1)^2}$

$= \dfrac{2x^2 + 2x - x^2}{x^2 + 2x + 1}$

$= \dfrac{x^2 + 2x}{x^2 + 2x + 1}$

c) $\dfrac{dy}{dx} = \dfrac{\cos x(x) - \sin x(1)}{x^2}$

$= \dfrac{x\cos x - \sin x}{x^2}$

b) $\dfrac{dy}{dx} = \dfrac{(4x^3)x^2 - (x^4+1)2x}{x^4}$

$= \dfrac{4x^5 - 2x^5 - 2x}{x^4}$

$= \dfrac{2x^5 - 2x}{x^4} = \dfrac{2(x^4 - 1)}{x^3}$