

# Quotient Rule.notebook

## The Quotient Rule

If  $h(x) = \frac{f(x)}{g(x)}$

then  $h'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$

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

or  
lo d'hi - hi d'lo  
 the bottom all squared

ex. 1 Find  $f'(x)$

a)  $f(x) = \frac{x^2+1}{x^3+2}$

$$f'(x) = \frac{(x^3+2)(2x) - (x^2+1)(3x^2)}{(x^3+2)^2}$$

$$f'(x) = \frac{2x^4+4x - 3x^4-3x^2}{(x^3+2)^2}$$

$$= \frac{-x^4 - 3x^2 + 4x}{(x^3+2)^2}$$

b)  $f(x) = \frac{x^2+x-2}{x^3+6}$

$$f'(x) = \frac{(x^3+6)(2x+1) - (x^2+x-2)(3x^2)}{(x^3+6)^2}$$

$$= \frac{2x^4+x^3+12x+6 - 3x^4-3x^3+6x^2}{(x^3+6)^2}$$

$$= \frac{-x^4 - 2x^3 + 6x^2 + 12x + 6}{(x^3+6)^2}$$

ex. 2 Differentiate

$$f(x) = \frac{3x^2 + 2\sqrt{x}}{x}$$

$$f(x) = \frac{3x^2 + 2x^{\frac{1}{2}}}{x}$$

$$f(x) = \frac{3x^2}{x} + \frac{2x^{\frac{1}{2}}}{x}$$

$$f(x) = 3x + 2x^{-\frac{1}{2}}$$

$$f'(x) = 3 - x^{-\frac{3}{2}}$$

Sometimes simplifying eliminates the need for the quotient rule.

or

$$f'(x) = \frac{x(6x + x^{-\frac{3}{2}}) - (3x^2 + 2\sqrt{x})(1)}{x^2}$$

$$= \frac{6x^2 + x^{\frac{1}{2}} - 3x^2 - 2x^{\frac{1}{2}}}{x^2}$$

$$= \frac{3x^2 - x^{\frac{1}{2}}}{x^2}$$

$$= \frac{3x^2}{x^2} - \frac{x^{\frac{1}{2}}}{x^2}$$

$$= 3 - x^{-\frac{3}{2}}$$

← can stop here

Pg. 124  
 #17, 18, 21  
 23, 6, c, 25, 27  
 Try 19