

2.9 The Quotient Rule

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **the quotient rule**.

You must be able to:

- differentiate a quotient with the **quotient rule** 商法则 $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ The quotient rule

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}.$$

■ Example

$$\frac{d}{dx} \left[\frac{x}{x+1} \right] = \frac{(1)(x+1) - x(1)}{(x+1)^2} = \frac{1}{(x+1)^2}.$$

2 Practice

2.1 State the quotient rule. [1]

2.2 Differentiate $\frac{1}{x}$ using the quotient rule. [2]

2.3 State the denominator of the quotient-rule result. [1]

3 Exam-style questions

3.1 $\left(\frac{f}{g}\right)'$ equals [1]

- A $\frac{f'g - fg'}{g^2}$
 - B $\frac{f'g + fg'}{g^2}$
 - C $\frac{f'}{g'}$
 - D $\frac{fg' - f'g}{g^2}$
-

3.2 In the quotient rule, the denominator is [1]

- A g
 - B g^2
 - C f^2
 - D fg
-

3.3 $y = \frac{x}{x+2}$.

(a) Identify f and g . [1]

(b) Apply the rule. [1]

(c) Simplify. [1]

4 Go further

- work through the **2.9 The Quotient Rule** lesson on the **Learn** page;
- read the **Differentiation: Definition and Fundamental Properties** section of the AP Calculus AB handout on the **Know** page.

Solutions

2.1 $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}.$

2.2 with $f = 1$, $g = x$: $\frac{(0)(x) - (1)(1)}{x^2} = -\frac{1}{x^2}.$

2.3 g^2 (the square of the denominator).

3.1 A.

3.2 B.

3.3 (a) $f = x$, $g = x + 2$. (b) $\frac{(1)(x+2) - x(1)}{(x+2)^2}.$ (c) $\frac{2}{(x+2)^2}.$