2.9 The Quotient Rule

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS quotient rule

Objective

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

You must be able to:

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

1 Key knowledge and 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]

Solutions

Each answer shows the steps, then the **result**.

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

- $\frac{f'g - fg'}{g^2}$.

3.2 B

- g^2.

3.3

(a)

- $f = x$, $g = x + 2$

(b)

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

(c)

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