

# 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 BC 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)  $\frac{2}{(x + 2)^2}$ .