

2.8 The Product Rule

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

KEY WORDS product rule 乘积法则 • power rule 幂法则 • quotient rule 商法则

Objective

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

You must be able to:

- differentiate a product with the **product rule** 乘积法则 $(fg)' = f'g + fg'$

1 Worked examples

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

■ **The product rule**

$$(fg)' = f'g + fg'$$

■ **Example**

$$\frac{d}{dx}[x \sin x] = (1) \sin x + x \cos x = \sin x + x \cos x.$$

2 Practice

2.1 State the product rule. [1]

2.2 Differentiate $x e^x$. [2]

2.3 State when you need the product rule. [1]

3 Exam-style questions

3.1 $(fg)'$ equals [1]

- A $f'g'$
- B $f'g + fg'$
- C $f'g - fg'$
- D f'/g'

3.2 $\frac{d}{dx}[x^2 \sin x]$ uses the [1]

- A power rule only
- B product rule
- C quotient rule
- D chain rule only

3.3 $y = x \cos x$.

(a) Identify f and g . [1]

(b) Apply the product rule. [1]

(c) State y' . [1]

Solutions

2.1 $(fg)' = f'g + fg'$.

2.2 $(1)e^x + xe^x = e^x(1+x)$.

2.3 when differentiating a product of two functions of x .

3.1 B.

3.2 B.

3.3 (a) $f = x$, $g = \cos x$. (b) $(1)\cos x + x(-\sin x)$. (c) $y' = \cos x - x \sin x$.