

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) $y' = \cos x - x\sin x$.