2.8 The Product Rule

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

KEY WORDS product rule • power rule • quotient rule

Objective

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

You must be able to:

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

1 Key knowledge and 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 $\dfrac{d}{dx}[x^2 \sin x]$ 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

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

2.1

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

2.2

- $(1)e^x + x\,e^x = e^x(1 + x)$

2.3

- when differentiating a product of two functions of x

3.1 B

- $f'g + fg'$.

3.2 B

- product rule.

3.3

(a)

- $f = x,\ g = \cos x$

(b)

- $(1)\cos x + x(-\sin x)$

(c)

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