

# 3.2 Implicit Differentiation

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ **Total: 9 marks**

**KEY WORDS** implicit differentiation 隐函数求导 • implicit relation 隐式关系  
• chain rule 链式法则

## Objective

Build the skills to answer exam questions on **implicit differentiation**.

**You must be able to:**

- differentiate an **implicit relation** 隐式关系 by attaching  $\frac{dy}{dx}$  to every  $y$
- solve for  $\frac{dy}{dx}$

## 1 Worked examples

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

### ■ Implicit differentiation

Differentiate both sides with respect to  $x$ , writing  $y'$  each time you differentiate  $y$  (the chain rule), then solve for  $y'$ .

### ■ Example

$$x^2 + y^2 = 25 \Rightarrow 2x + 2y y' = 0 \Rightarrow y' = -\frac{x}{y}.$$

## 2 Practice

**2.1** State what to attach when differentiating  $y$ . [1]

**2.2** Differentiate  $x^2 + y^2 = 25$  implicitly. [2]

**2.3** State the final step. [1]

## 3 Exam-style questions

**3.1** In implicit differentiation, differentiating  $y^2$  gives [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A  $2y$   
B  $2y y'$   
C  $y'$   
D  $2x$

**3.2** After differentiating, you [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A stop  
B solve for  $\frac{dy}{dx}$   
C set  $y = 0$   
D integrate

**3.3**  $x^2 + y^2 = 25$ .

(a) Differentiate both sides. [1]

(b) Isolate the  $y'$  term. [1]

(c) Solve for  $y'$ . [1]