

Exercise walk-through

Implicitly Defined Functions ■ 4.5

eXercise

You must be able to

- recognise an **implicitly defined** 隐式定义 relation such as $x^2 + y^2 = 25$
- solve it for y and decide whether it is a function

Method — Implicit relations

An implicit equation relates x and y without solving for y — for example $x^2 + y^2 = 25$ (a circle). It may fail the vertical-line test, so it need not be a function.

Method — Example

$x^2 + y^2 = 25$ is a circle of radius 5; solving gives $y = \pm\sqrt{25 - x^2}$.

Practice 2.1 ■ 1 mark

State what “implicitly defined” means.

Solution 2.1

Worked steps

given by an equation in x and y that is not solved for y **B1**.

Practice 2.2 ■ 1 mark

State the shape of $x^2 + y^2 = 9$.

Solution 2.2

Worked steps

a circle of radius 3 centred at the origin **B1**.

Practice 2.3 ■ 2 marks

Solve $x^2 + y^2 = 25$ for y .

Solution 2.3

Worked steps

$$y = \pm\sqrt{25 - x^2} \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

An implicitly defined relation is one

- A** solved for y
- B** written as an equation in x and y
- C** always a function
- D** always linear

Solution 3.1

- A solved for y
- B written as an equation in x and y 
- C always a function
- D always linear

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The graph of $x^2 + y^2 = 16$ is

- A** a line
- B** a circle of radius 4
- C** a parabola
- D** two points

Solution 3.2

A a line

B a circle of radius 4



C a parabola

D two points

Worked steps

B.

Exam-style 3.3 ■ 1 mark

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

- (a) State the radius.
- (b) Solve for y .
- (c) State whether it is a function.

Solution 3.3

Worked steps

(a) 5 **B1**. (b) $y = \pm\sqrt{25 - x^2}$ **B1**. (c) no (it fails the vertical-line test) **B1**.