

Exercise walk-through

Trigonometry and Polar Coordinates ■ 3.13

eXercise

You must be able to

- convert between **polar** 极坐标 (r, θ) and rectangular (x, y) coordinates

Method — Polar coordinates

A point is (r, θ) : r is the distance from the origin, θ the angle. Convert with

$$x = r \cos \theta, \quad y = r \sin \theta, \quad r = \sqrt{x^2 + y^2}, \quad \tan \theta = \frac{y}{x}.$$

Method — Example

$(r, \theta) = (2, 0)$: $x = 2 \cos 0 = 2$, $y = 2 \sin 0 = 0$, so the point is $(2, 0)$.

Practice 2.1 ■ 1 mark

State x in terms of r and θ .

Solution 2.1

Worked steps

$$x = r \cos \theta \quad \text{B1}.$$

Practice 2.2 ■ 1 mark

State the formula for r given x and y .

Solution 2.2

Worked steps

$$r = \sqrt{x^2 + y^2} \quad \text{B1}.$$

Practice 2.3 ■ 2 marks

Convert $(r, \theta) = (2, 0)$ to rectangular coordinates.

Solution 2.3

Method: Polar coordinates

Worked steps

$x = 2 \cos 0 = 2$; $y = 2 \sin 0 = 0$; point $(2, 0)$ **M1** **A1**.

Exam-style 3.1 ■ 1 mark

In polar coordinates, x equals

A $r \sin \theta$

B $r \cos \theta$

C r/θ

D $r + \theta$

Solution 3.1

Method: Polar coordinates

A $r \sin \theta$

B $r \cos \theta$



C r/θ

D $r + \theta$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The radius r equals

A $x + y$

B $\sqrt{x^2 + y^2}$

C $x^2 + y^2$

D x/y

Solution 3.2

A $x + y$

B $\sqrt{x^2 + y^2}$



C $x^2 + y^2$

D x/y

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Convert $(r, \theta) = (4, \frac{\pi}{2})$.

- (a) Find x .
- (b) Find y .
- (c) State the rectangular point.

Solution 3.3

Method: Polar coordinates

Worked steps

(a) $x = 4 \cos \frac{\pi}{2} = 0$ **B1**. (b) $y = 4 \sin \frac{\pi}{2} = 4$ **B1**. (c) $(0, 4)$ **B1**.