

3.13 Trigonometry and Polar Coordinates

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **trigonometry and polar coordinates**.

You must be able to:

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

1 Worked examples

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

■ Polar coordinates

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

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

■ Example

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

2 Practice

2.1 State x in terms of r and θ . [1]

2.2 State the formula for r given x and y . [1]

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

3 Exam-style questions

3.1 In polar coordinates, x equals [1]

- **A** $r \sin \theta$
 - **B** $r \cos \theta$
 - **C** r/θ
 - **D** $r + \theta$
-

3.2 The radius r equals [1]

- **A** $x + y$
 - **B** $\sqrt{x^2 + y^2}$
 - **C** $x^2 + y^2$
 - **D** x/y
-

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

(a) Find x . [1]

(b) Find y . [1]

(c) State the rectangular point. [1]

4 Go further

- work through the **3.13 Trigonometry and Polar Coordinates** lesson on the **Learn** page;
- read the **Trigonometric and Polar Functions** section of the AP Precalculus hand-out on the **Know** page.

Solutions

2.1 $x = r \cos \theta$.

2.2 $r = \sqrt{x^2 + y^2}$.

2.3 $x = 2 \cos 0 = 2$; $y = 2 \sin 0 = 0$; point $(2, 0)$.

3.1 B.

3.2 B.

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