AP PRECALCULUS • EXERCISE SHEET

3.13 Trigonometry and Polar Coordinates

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

KEY WORDS polar 极坐标

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

(a) Find x. [1]

(b) Find y. [1]

(c) State the rectangular point. [1]

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) $(0, 4)$.