

4.4 Parametrically Defined Circles and Lines

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **parametrically defined circles and lines**.

You must be able to:

- write parametric equations for a **circle** 圆 and a **line** 直线

1 Worked examples

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

■ Circles and lines

- **circle** of radius r (centred at the origin): $x = r \cos t$, $y = r \sin t$;
- **line** through (x_0, y_0) with direction (a, b) : $x = x_0 + at$, $y = y_0 + bt$.

■ Example

$x = 3 \cos t$, $y = 3 \sin t$ is a circle of radius 3.

2 Practice

2.1 Write parametric equations for a circle of radius 5. [2]

2.2 State the radius of $x = 2 \cos t$, $y = 2 \sin t$. [1]

2.3 For the line $x = 1 + 2t$, $y = 3 + t$, state the point at $t = 0$. [1]

3 Exam-style questions

3.1 A circle of radius r is [1]

- **A** $x = rt, y = rt$
 - **B** $x = r \cos t, y = r \sin t$
 - **C** $x = t, y = r$
 - **D** $x = r + t, y = r - t$
-

3.2 The line $x = x_0 + at, y = y_0 + bt$ passes through [1]

- **A** the origin
 - **B** (x_0, y_0) at $t = 0$
 - **C** (a, b)
 - **D** (t, t)
-

3.3 $x = 4 \cos t, y = 4 \sin t$.

(a) State the shape. [1]

(b) State the radius. [1]

(c) State the point at $t = 0$. [1]

4 Go further

- work through the **4.4 Parametrically Defined Circles and Lines** lesson on the **Learn** page;
- read the **Functions Involving Parameters, Vectors, and Matrices** section of the AP Precalculus handout on the **Know** page.

Solutions

2.1 $x = 5 \cos t$, $y = 5 \sin t$.

2.2 2.

2.3 $(1, 3)$.

3.1 B.

3.2 B.

3.3 (a) a circle. (b) 4. (c) $(4, 0)$.