

4.2 Parametric Functions Modeling Planar Motion

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

KEY WORDS position 位置 • direction of motion 运动方向 • parametric function 参数函数

Objective

Build the skills to answer exam questions on **parametric functions modeling planar motion**.

You must be able to:

- read an object's **position** 位置 $(x(t), y(t))$ at time t
- find the **direction of motion** 运动方向 as t increases

1 Worked examples

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

■ Planar motion

Parametric equations model a moving object's position at time t : $(x(t), y(t))$. Increasing t traces the curve in the **direction of motion**.

■ Example

$x = t, y = t^2$: at $t = 0$ the object is at $(0, 0)$; as t grows it moves right and up.

2 Practice

2.1 State what $(x(t), y(t))$ represents in a motion problem. [1]

2.2 State how you find the direction of motion. [1]

2.3 For $x = t, y = 3t$, find the positions at $t = 0$ and $t = 1$. [2]

3 Exam-style questions

3.1 Parametric equations of motion give an object's [1]

- **A** speed only
- **B** position at each time
- **C** mass
- **D** energy

3.2 The direction of motion is found by [1]

- **A** increasing t
- **B** decreasing x
- **C** setting $t = 0$
- **D** the amplitude

3.3 An object has $x = t, y = 4 - t$.

(a) State the position at $t = 0$. [1]

(b) State the position at $t = 4$. [1]

(c) Describe the horizontal motion. [1]

Solutions

2.1 the object's position in the plane at time t .

2.2 trace the curve in the direction of increasing t .

2.3 $t = 0$: $(0, 0)$; $t = 1$: $(1, 3)$.

3.1 B.

3.2 A.

3.3 (a) $(0, 4)$. (b) $(4, 0)$. (c) it moves to the right, since $x = t$ increases with t .