Exercise walk-through

Vector-Valued Functions ▪ 4.9

eXercise

You must be able to

- interpret a **vector-valued function 向量值函数** $\vec{r}(t) = \langle x(t), y(t) \rangle$
- evaluate it at a value of t

Method — Vector-valued functions

$\vec{r}(t) = \langle x(t), y(t) \rangle$ gives a **position vector** at each t — the same information as parametric motion, written as a vector.

Method — Example

$\vec{r}(t) = \langle t, t^2 \rangle$: at $t = 2$, $\vec{r}(2) = \langle 2, 4 \rangle$.

Practice 2.1 ▪ 1 mark

State what $\vec{r}(t) = \langle x(t), y(t) \rangle$ gives.

Solution 2.1

Method: Vector-valued functions

Worked steps

a position vector for each value of t B1.

Practice 2.2 ▪ 2 marks

For $\vec{r}(t) = \langle 2t, t \rangle$, find $\vec{r}(3)$.

Solution 2.2

Worked steps

$\vec{r}(3) = \langle 6, 3 \rangle$ M1 A1.

Practice 2.3 ▪ 1 mark

State the connection between vector-valued and parametric functions.

Solution 2.3

Method: Vector-valued functions

Worked steps

they carry the same information — the components $x(t)$, $y(t)$ are the parametric equations B1.

Exam-style 3.1 ▪ 1 mark

A vector-valued function $\vec{r}(t) = \langle x(t), y(t) \rangle$ describes

A a single number

B a position vector at each t

C a slope

D an area

Solution 3.1

Method: Vector-valued functions

A a single number

B a position vector at each t ✓

C a slope

D an area

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

For $\vec{r}(t) = \langle t, 2t \rangle$, $\vec{r}(1)$ equals

A $\langle 1, 2 \rangle$

B $\langle 2, 1 \rangle$

C $\langle 1, 1 \rangle$

D $\langle 2, 2 \rangle$

Solution 3.2

A $\langle 1, 2 \rangle$ ✓

B $\langle 2, 1 \rangle$

C $\langle 1, 1 \rangle$

D $\langle 2, 2 \rangle$

Worked steps

A.

Exam-style 3.3 ▪ 1 mark

$\vec{r}(t) = \langle t + 1, 3t \rangle$.
(a) Find $\vec{r}(0)$.
(b) Find $\vec{r}(2)$.
(c) State the x-component function.

Solution 3.3

Worked steps

(a) $\langle 1, 0 \rangle$ B1. (b) $\langle 3, 6 \rangle$ B1. (c) $x(t) = t + 1$ B1.