Vector-valued position functions

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Evaluate $r(3)$ for $(2t, t^2 - 1, 5)$. [2 marks]

Substitute 3 into each coordinate.

The third coordinate stays 5.

Answer: $(6, 8, 5)$

2. Find displacement from 0 to 1 for (t, t^2, t^3). [2 marks]

The initial vector is zero.

The final vector is $(1, 1, 1)$.

Answer: $(1, 1, 1)$

3. Find distance from the origin for $(3\cos t, 3\sin t, 2)$. [2 marks]

Magnitude squared is $9(\cos^2 t + \sin^2 t) + 4$.

This equals 13.

Answer: $\sqrt{13}$

4. Find endpoint separation between $(1, 2, 3)$ and $(4, 6, 3)$. [2 marks]

The displacement is $(3, 4, 0)$.

Its magnitude is 5.

Answer: 5 units.

5. Identify the Cartesian path of $(t^2, 2t)$. [2 marks]

$t = \frac{y}{2}$.

Substitute into x.

Answer: $y^2 = 4x$.

6. Give a position function for the line through $(1, 0, 2)$ with direction $(2, -1, 3)$. [2 marks]

At zero the given point is obtained.

The parameter moves along the required direction.

Answer: $\mathbf{r} = (1, 0, 2) + t(2, -1, 3)$.