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]

$t = y/2$.

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