Coordinates varying at constant rates

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Write position from initial (3, 2) m and velocity (4, -1) m/s. [2 marks]

Use initial position plus t times velocity.

Check at t=0.

Answer: $(3 + 4t, 2 - t)$ m.

2. Find speed for $(5 + 8t,\ -2 + 6t)$ m. [2 marks]

Velocity is (8, 6).

Speed is $\sqrt{64 + 36}$.

Answer: 10 m/s.

3. A is at $(t, 2t)$ and B at $(4 - t, 4)$. Find collision time. [2 marks]

Equate x to get t=2.

Both y coordinates then equal 4.

Answer: t=2, at (2, 4).

4. A is at (t, t) and B at $(2 - t, 3 - t)$. Do they collide? [2 marks]

Equal x requires t=1.

At t=1, their y values are 1 and 2.

Answer: No.

5. A particle moves from (1, 1, 2) to (7, -3, 2) in 2 s. Find constant velocity. [2 marks]

Displacement is (6, -4, 0).

Divide by 2.

Answer: $(3, -2, 0)$ units/s.

6. Find distance travelled by $(1 + 2t, 3 + t)$ on $0 \leq t \leq 4$. [2 marks]

Constant speed is $\sqrt{5}$.

Multiply by elapsed time 4.

Answer: $4\sqrt{5}$ units.