# Displacement and total distance

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

**1.** $v(t) = 3$ m/s on $[0, 5]$. Find displacement and distance. [3 marks]

Velocity is positive throughout; integrate 3 over 5 seconds.

**Answer:** Both 15 m.

**2.** $v(t) = -2$ m/s on $[0, 4]$. Find displacement and distance. [3 marks]

Velocity remains negative; integrate speed 2 for distance.

**Answer:** Displacement$-8$ m; distance 8 m.

**3.** $v(t) = t - 1$ m/s on $[0, 3]$. Find displacement and distance. [3 marks]

Split at 1: contributions $-1/2$ and 2.

Add signed values or magnitudes as needed.

**Answer:** 3/2 m and 5/2 m.

**4.** $v(t) = (t-2)^2$ m/s on $[0, 4]$. Does it change direction at 2? Find distance. [3 marks]

Velocity is nonnegative on both sides of 2.

$[(t-2)^3/3]_0^4 = 16/3$.

**Answer:** No; distance 16/3 m.

**5.** $v(t) = 2t$ m/s and initial position is 5 m. Find position at 3 s. [3 marks]

Displacement $= \int_0^3 2t\,dt = 9$ m.

Position 5+9=14 m.

**Answer:** 14 m

**6.** $v(t) = \cos t$ m/s for $0 \le t \le \pi$. Find distance. [3 marks]

Split at $\pi/2$. Integrals are 1 and $-1$; add their magnitudes.

**Answer:** 2 m