Marked example 2

Paper 1 style · No calculator

2 7 marks SL 5.9 · 5.11 ●●○ Typical

A particle moves in a straight line with velocity $v(t) = 3t^2 - 12\ \text{m s}^{-1}$, for $0 \leq t \leq 3$, where t is in seconds.

(a) Find the time at which the particle is at rest. **[2]**

(b) Find the displacement of the particle at $t = 3$ from its position at $t = 0$. **[3]**

(c) Find the total distance travelled by the particle. **[2]**

MARKSCHEME (a)

$3(t-2)(t+2) = 0$ **(M1)**

$t = 2$ **A1**

Total 2 marks

MARKSCHEME (b)

$\int_0^3 (3t^2 - 12)\,\mathrm{d}t$ **M1**

$\left[t^3 - 12t\right]_0^3$ **A1**

$= 27 - 36 = -9\ \text{m}$ **A1**

Total 3 marks

MARKSCHEME (c)

$\int_0^2 v\,\mathrm{d}t = -16,\ \int_2^3 v\,\mathrm{d}t = -9 - (-16) = 7$ **M1**

$16 + 7 = 23\ \text{m}$ **A1**

Total 2 marks

Note Split at $t = 2$, where v changes sign; add the sizes.

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