Exercise 3

Paper 2 style · Graphic display calculator

3 6 marks SL 5.9 ●●○ Typical

A particle moves along a straight line with velocity $v(t) = t^2 - 6 + 5\cos t$ metres per second, for $0 \leq t \leq 4$, where t is in seconds.

(a) Find the value of t at which the particle is at rest. **[1]**

(b) Find the greatest speed of the particle. Justify your answer. **[3]**

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

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$t = 3.31 \quad (3.30639\ldots)$ **A1**

Total 1 mark

MARKSCHEME (b)

the minimum of v: -4.12 at $t = 2.13$, and $v(4) = 6.73$ **M1**

the largest value of $|v|$ is at $t = 4$ **R1**

$6.73\ \text{m}\,\text{s}^{-1} \quad (6.73178\ldots)$ **A1**

Total 3 marks

Note 4.12 (the size of the least velocity) is not the greatest speed: M1R0A0.

MARKSCHEME (c)

$\int_0^4 |v(t)|\,\mathrm{d}t$ **(M1)**

$10.8\ \text{m} \quad (10.7690\ldots)$ **A1**

Total 2 marks