Exercise 3

Paper 2 style · Graphic display calculator

3 5 marks SL 5.9 ●●○ Typical

A particle moves in a straight line with velocity $v(t) = 6\sin t - t$ m s^{-1}, for $0 \leq t \leq 5$.

(a) Find the value of $t > 0$ at which the particle changes direction. **[1]**

(b) Find the displacement of the particle at $t = 5$ from its position at $t = 0$. **[2]**

(c) Find the total distance travelled. **[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)

$t = 2.68 \quad (2.67878\ldots)$ **A1**

Total 1 mark

MARKSCHEME (b)

$\int_0^5 (6\sin t - t)\,\mathrm{d}t$ **(M1)**

$= -8.20 \text{ m} \quad (-8.20197\ldots)$ **A1**

Total 2 marks

MARKSCHEME (c)

$\int_0^5 |6\sin t - t|\,\mathrm{d}t$ **(M1)**

$= 23.8 \text{ m} \quad (23.7637\ldots)$ **A1**

Total 2 marks