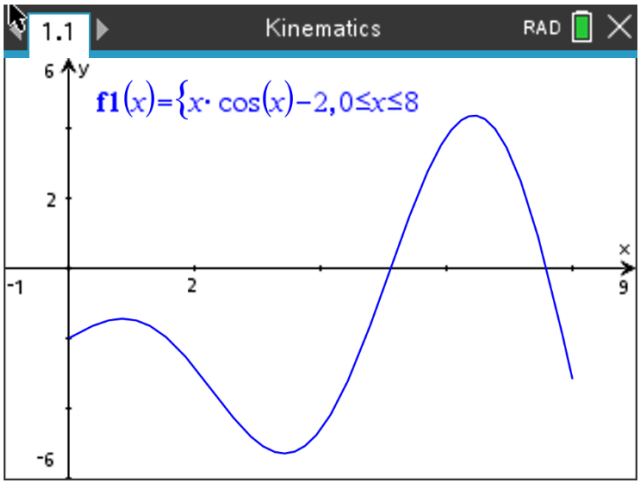
Topic 5: Calculus **Kinematics**

A particle moves in a straight line. The velocity, $v\ ms^{-1}$, of the particle at time t seconds is given by $v(t) = t\cos t - 2, for\ 0 \leq t \leq 8$.

The following diagram shows the graph of v.



(a) Find the smallest value of t for which the particle is at rest. [2 marks]

(b) Find the total distance travelled by the particle. [2 marks]

(c) Find the acceleration of the particle when $t = 6$. [2 marks]

Mark scheme:

(a) Setting $v(t) = 0$ (M1)

$t = 5.114\ldots$

$t = 5.11\ sec$ A1

Note: Do not award **A1** if multiple times are given.

[2 marks]

(b) $\int_0^8 |v(t)|\ dt$

$or\ -\int_0^{5.1141\ldots} v(t)\ dt\ +\ \int_{5.1141\ldots}^{7.5872\ldots} v(t)\ dt - \int_{7.5872\ldots}^{8} v(t)\ dt$ A1

$= 23.135066\ldots$

$= 23.1\ m$ A1

[2 marks]

(c) Finding $a(6) = v'(6)$ (M1)

Acceleration = 2.63666…

$= 2.64\ ms^{-2}$ A1

[2 marks]