Xinmin Secondary School
Additional Mathematics [401]
Topic: Kinematics

Name: _____ ( ) Date: _____

Complete **all** questions on writing paper.

Question 1

A particle starts from point *O* and moves in a straight line with a velocity, $v\,\text{m s}^{-1}$, given by $v = -2t^2 + t + 15$, where *t* seconds is the time after leaving *O*. Calculate

(a) the acceleration of the particle when it is instantaneously at rest,
(b) the initial acceleration,
(c) the total distance travelled by the particle from $t = 2$ to $t = 6$.

Answer

(a) $-11\,\text{m s}^{-2}$ (b) $1\,\text{m s}^{-2}$ (c) $72\frac{1}{3}\,\text{m}$

Question 2

A particle starts moving in a straight line, with a displacement of 3 m away from a fixed point *O*. The velocity, $v\,\text{m s}^{-1}$, of the particle *t* seconds after the start of its motion, is given by $v = 4 - e^{2t}$.

Find

(a) the initial acceleration of the particle,
(b) the time when the particle is instantaneously at rest,
(c) the total distance travelled by the particle in the first 2 seconds, correct to 3 significant figures.

Answer

(a) $-2\,\text{m s}^{-2}$ (b) (ln 2) s (c) 21.3 m

Question 3

A particle moves in a straight line such that its distance from a fixed point *O*, *t* seconds after leaving *O*, is given by $s = 3t - 2 + 2\cos 2t$. Find

(a) the velocity and acceleration of the particle in terms of *t*,
(b) the time when the particle is first instantaneously at rest, correct to 3 significant figures,
(c) the distance travelled by the particle in the first second of motion, correct to 3 significant figures

Answer

(a) $v = 3 - 4\sin 2t;\ a = -8\cos 2t$ (b) 0.424 s (c) 1.02 units