DYNAMICS WITH CALCULUS : 1

JUNE 1996 M1

1. A particle P moves along the x-axis so that its velocity at time t s is v m s^{-1} where $v = 8t^3 - 6t + 2$.

Given that P is at the origin at time $t = 0$, find

(*a*) the distance of P from the origin when $t = 1$, [3]

(*b*) the acceleration of P when $t = 2$. [2]

JUNE 1997 M1

2. A particle P is moving along the x axis and its velocity v m s^{-1} in the positive x direction at time t s is given by

$$v = 3t^2 - 24t + 21.$$

(*a*) Find the acceleration of P at time t s. [2]

(*b*) Find x at time t s given that $x = 0$ when $t = 0$. [2]

(*c*) Find the values of t for which the particle is instantaneously at rest and the distance between the points of instantaneous rest. [3]

3. A particle P, of mass 3 kg, moves along the horizontal x-axis under the action of a resultant force F N. Its velocity v ms^{-1} at time t seconds is given by

JUNE 2006 M2

$$v = 12t - 3t^2.$$

(*a*) Given that the particle is at the origin O when $t = 1$, find an expression for the displacement of the particle from O at time t s. [4]

(*b*) Find the acceleration of the particle at time t s. [2]

4. A particle moves along a straight horizontal line. Its velocity $v$ms^{-1} at time ts, is given by

JUNE 2013 M2

$$v = 2t(t - 6).$$

(*a*) Find the set of values of t for which the velocity of the particle is negative. [2]

(*b*) Find the total distance travelled by the particle in the interval $0 \leqslant t \leqslant 9$. [5]

5. A particle P, of mass 0·8 kg, moves along the x-axis so that its velocity at time t seconds is $v$ms^{-1}, where $v = 4t^3 - 6t + 7$. Given that the displacement of P is 5 m from the origin when $t = 0$, find

JUNE 2017 M2

(*a*) the displacement of P from the origin when $t = 2$, [5]

(*b*) the force acting on P when $t = 3$. [4]

JAN 1998 M1

6. A particle is moving along the x-axis. Its velocity v ms^{-1} is given at time t s by

$$v = 5t^4 + 3t^2.$$

(*a*) Find the acceleration of the particle when $t = 1$. [2]

(*b*) Given that $x = 1$ m when $t = 0$, find x when $t = 2$. [3]