

Variable Acceleration - Past Edexcel Exam Questions

1. (Question 4 - M2 June 2017)

4. At time $t = 0$ a particle P leaves the origin O and moves along the x -axis. At time t seconds, the velocity of P is $v \text{ ms}^{-1}$ in the positive x direction, where

$$v = 3t^2 - 16t + 21$$

The particle is instantaneously at rest when $t = t_1$ and when $t = t_2$ ($t_1 < t_2$).

- (a) Find the value of t_1 and the value of t_2 . (2)
- (b) Find the magnitude of the acceleration of P at the instant when $t = t_1$. (3)
- (c) Find the distance travelled by P in the interval $t_1 \leq t \leq t_2$. (4)
- (d) Show that P does not return to O . (3)

2. (Question 1 - M2 June 2016)

1. A particle P moves along a straight line. The speed of P at time t seconds ($t \geq 0$) is $v \text{ m s}^{-1}$, where $v = (pt^2 + qt + r)$ and p, q and r are constants. When $t = 2$ the speed of P has its minimum value. When $t = 0, v = 11$ and when $t = 2, v = 3$

Find

- (a) the acceleration of P when $t = 3$ (8)
- (b) the distance travelled by P in the third second of the motion. (5)

3. (Question 6 - M2 June 2015)

6. A particle P moves on the positive x -axis. The velocity of P at time t seconds is $(2t^2 - 9t + 4) \text{ m s}^{-1}$. When $t = 0$, P is 15 m from the origin O .

Find

- (a) the values of t when P is instantaneously at rest, (3)
- (b) the acceleration of P when $t = 5$ (3)
- (c) the total distance travelled by P in the interval $0 \leq t \leq 5$ (5)

4. (Question 3 - M2 June 2013)

3. A particle P moves on the x -axis. At time t seconds the velocity of P is $v \text{ m s}^{-1}$ in the direction of x increasing, where

$$v = 2t^2 - 14t + 20, \quad t \geq 0$$

Find

- (a) the times when P is instantaneously at rest, (3)
- (b) the greatest speed of P in the interval $0 \leq t \leq 4$ (5)
- (c) the total distance travelled by P in the interval $0 \leq t \leq 4$ (5)

5.

(Question 6 - M2 June 2011)

6. A particle P moves on the x -axis. The acceleration of P at time t seconds is $(t - 4) \text{ m s}^{-2}$ in the positive x -direction. The velocity of P at time t seconds is $v \text{ m s}^{-1}$. When $t = 0$, $v = 6$.

Find

- (a) v in terms of t , (4)
- (b) the values of t when P is instantaneously at rest, (3)
- (c) the distance between the two points at which P is instantaneously at rest. (4)
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6.

(Question 1 - M2 June 2010)

1. A particle P moves on the x -axis. The acceleration of P at time t seconds, $t \geq 0$, is $(3t + 5) \text{ m s}^{-2}$ in the positive x -direction. When $t = 0$, the velocity of P is 2 m s^{-1} in the positive x -direction. When $t = T$, the velocity of P is 6 m s^{-1} in the positive x -direction. Find the value of T .

(6)

Solutions

1. (a) $t_1 = \frac{7}{3}, t_2 = 3$
(b) 2
(c) $\frac{4}{27}$ metres
(d) (Show that position $P(t)$ cannot equal 0)
2. (a) $a = 4 \text{ ms}^{-2}$
(b) $\frac{11}{3}$ metres
3. (a) $t = \frac{1}{2}, 4$
(b) $a = 11 \text{ ms}^{-2}$
(c) $19\frac{5}{12}$ metres
4. (a) $t = 2, t = 5$
(b) 20 m/s
(c) 24 metres
5. (a) $v(t) = \frac{1}{2}t^2 - 4t + 6$
(b) $t = 2, t = 6$
(c) $\frac{16}{3}$ metres
6. $T = \frac{2}{3}$