A Level Maths

Topic: Variable Acceleration (Calculus-Based)

Instructions

Answer all questions. Show complete working. Use calculus to solve problems involving variable acceleration and motion.

Practice Questions

1. The velocity of a particle is given by $v(t) = 3t^2 - 5t + 2$. Find the acceleration of the particle at time $t = 4$.

2. A particle's velocity is given by $v(t) = 2t^3 - 7t^2 + 4t - 1$. Find the position of the particle at time $t = 2$ if the initial position is $s(0) = 5$.

3. The acceleration of a car is given by $a(t) = 6t - 4$. Find the velocity of the car after 3 seconds, assuming the car starts at rest, i.e., $v(0) = 0$.

4. The acceleration of a particle is given by $a(t) = 4t - 3$. Find the velocity of the particle at time $t = 5$, given that the particle's initial velocity is $v(0) = 2$.

5. A particle moves with a velocity given by $v(t) = 5t^2 - 3t + 1$. Find the displacement of the particle from $t = 1$ to $t = 4$.

6. A particle's velocity is given by $v(t) = 2t^4 - 5t^3 + 4t^2$. Find the acceleration of the particle at $t = 2$.

7. The position of a car is given by $s(t) = 3t^4 - 5t^3 + 2t^2 - 6t + 4$. Find the velocity of the car at time $t = 3$.

8. The velocity of a particle is given by $v(t) = 4t^3 - 6t^2 + 8t - 3$. Find the displacement of the particle from $t = 0$ to $t = 2$.

9. The acceleration of an object is given by $a(t) = 3t^2 - 2t + 1$. Find the velocity of the object at $t = 4$ if the initial velocity is $v(0) = 3$.

10. A particle has a velocity of $v(t) = 2t^2 - 3t + 4$. Find the distance traveled by the particle from $t = 1$ to $t = 3$.

Multiple-Choice Questions

1. If the velocity of a particle is $v(t) = 5t^2 - 3t + 1$, the acceleration of the particle at $t = 2$ is:

   A. 17

   B. 20

   C. 22

   D. 21

2. The displacement of a particle is $s(t) = 3t^3 - 4t^2 + 2t + 5$. The velocity of the particle at $t = 2$ is:

   A. 10

   B. 11

   C. 12

   D. 14

3. The velocity of a particle is given by $v(t) = 2t^2 - 4t + 3$. The displacement of the particle from $t = 1$ to $t = 3$ is:

   A. 18

   B. 15

   C. 12

   D. 10

4. The acceleration of a particle is $a(t) = 6t - 4$. The velocity of the particle at $t = 3$ is:

   A. 15

   B. 18

   C. 17

   D. 14