

AS Mechanics Special Homework Chapter 4 – Variable Acceleration

- 1** A body moves in a straight line such that its velocity, $v \text{ m s}^{-1}$, at time $t \text{ s}$ is given by $v = -\frac{1}{3}(2t^2 - 9t - 18)$, $t \geq 0$.
- a** Find the initial velocity of the body. **(2 marks)**
- b** Find the value of t when the body is instantaneously at rest. **(3 marks)**
- c** Find the greatest speed of the body in the first seven seconds of motion. **(5 marks)**
- 2** A particle P moves along a straight line. Initially, P is at rest at a point O on the line. At time $t \text{ s}$, the velocity of P is $v \text{ m s}^{-1}$, where $v = \frac{1}{20}t(5-t)^2$, $0 \leq t \leq 8$.
- a** Sketch a velocity–time graph for the motion of P . **(2 marks)**
- b** Find the values of t and the corresponding values of v when the acceleration of P is instantaneously zero. **(5 marks)**
- 3** A particle P travels in a straight line.
- At time $t \text{ s}$, the displacement of P from a point O on the line is $s \text{ m}$. At time $t \text{ s}$, the acceleration of P is $(12t - 4) \text{ m s}^{-2}$. When $t = 1$, $s = 2$ and when $t = 3$, $s = 30$.
- Find the displacement when $t = 2$. **(8 marks)**