

| Question number | Scheme | Marks |
|-----------------|--|-------------------|
| 2 a | $v = \frac{dx}{dt} = 4t^3 - 13.5$ When $t = 3$ $v = 4(3)^3 - 13.5 = 94.5 \text{ ms}^{-1}$ | M1 A1 (2) |
| b | $4t^3 - 13.5 = 0 \Rightarrow t^3 = \frac{27}{8} \Rightarrow t = 1.5$ | M1 A1ft (2) |
| c | $a = \frac{dv}{dt} = 12t^2$ When $t = 2$ $a = 12 \times 2^2 = 48 \text{ ms}^{-2}$ | M1 A1 (2) |
| Total 6 marks | | |

| Part | Mark | Notes |
|--|------|---|
| Ignore incorrect/spurious notation through this question. e.g. ignore $\frac{dy}{dx} = \dots$ or the LHS | | |
| (a) | M1 | For an attempt to differentiate the given expression [with no terms integrated] See General Guidance for the definition of an attempt to differentiate. |
| | A1 | For substituting the value of $t = 3$ into their differentiated expression and obtains 94.5 (units not required) |
| (b) | M1 | For setting their $\frac{dx}{dt} = 0$ which must be at a minimum of the form $\pm kt^3 \pm l$ and attempting to find a value for t |
| | A1ft | For $t = 1.5$ Ft their expression for v which must have come from an acceptable attempt to differentiate the given x |
| (c) | M1 | For differentiating their $\frac{dx}{dt}$ which must be of the form $\frac{dx}{dt} \text{ (or } v) = \pm kt^3 \pm l$ where k and l are constants, [with no term integrated] |
| | A1 | For substituting $t = 2$ into their differentiated expression and obtains 48 (units not required) |