

- 65.) (a) (i) When $t = 0$, $v = 50 + 50e^0$ (A1)
 $= 100 \text{ m s}^{-1}$ (A1)
- (ii) When $t = 4$, $v = 50 + 50e^{-2}$ (A1)
 $= 56.8 \text{ m s}^{-1}$ (A1) 4

(b) $v = \frac{ds}{dt} \Rightarrow s = \int v dt$
 $\int_0^4 (50 + 50e^{-0.5t}) dt$ (A1)(A1)(A1) 3

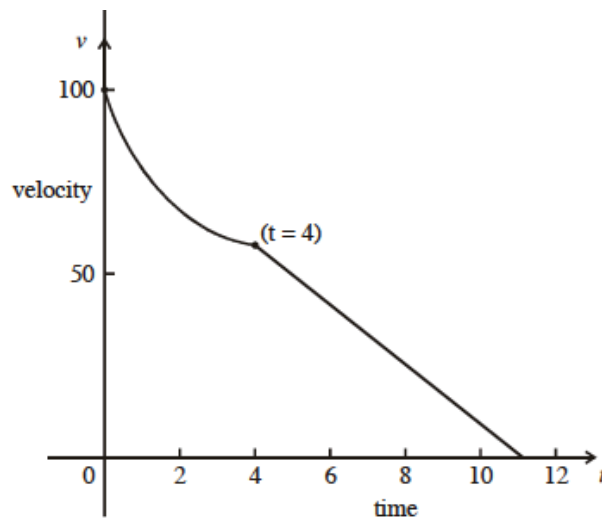
Note: Award (A1) for each limit in the correct position and (A1) for the function.

(c) Distance travelled in 4 seconds $= \int_0^4 (50 + 50e^{-0.5t}) dt$
 $= [50t - 100e^{-0.5t}]_0^4$ (A1)
 $= (200 - 100e^{-2}) - (0 - 100e^0)$
 $= 286 \text{ m (3 sf)}$ (A1)

Note: Award first (A1) for $[50t - 100e^{-0.5t}]$, ie limits not required.

OR

Distance travelled in 4 seconds = 286 m (3 sf) (G2) 2



Notes: Award (A1) for the exponential part, (A1) for the straight line through (11, 0), Award (A1) for indication of time on x-axis and velocity on y-axis, (A1) for scale on x-axis and y-axis. Award (A1) for marking the point where $t = 4$.

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(e) Constant rate $= \frac{56.8}{7}$ (M1)
 $= 8.11 \text{ m s}^{-2}$ (A1) 2
Note: Award (M1)(A0) for -8.11.

(f) distance $= \frac{1}{2} (7)(56.8)$ (M1)
 $= 199 \text{ m}$ (A1) 2

Note: Do not award ft in parts (e) and (f) if candidate has not used a straight line for $t = 4$ to $t = 11$ or if they continue the exponential beyond $t = 4$.