

Exercise II D

$$5) \quad v = 6t^2 - 51t + 90 \quad \begin{array}{l} t=0 \\ s=0 \end{array}$$

$$s = \frac{6t^3}{3} - \frac{51t^2}{2} + 90t + c \quad c=0$$

$$\underline{s = 2t^3 - \frac{51}{2}t^2 + 90t}$$

At rest $v=0 \Rightarrow 6t^2 - 51t + 90 = 0$

By calc

$$t = 6, \quad t = \frac{5}{2}$$

$$t = 6, \quad s = 2 \times 6^3 - \frac{51}{2}(6)^2 + 90(6) = 54 \text{ m}$$

$$t = \frac{5}{2} \quad s = 2\left(\frac{5}{2}\right)^3 - \frac{51}{2}\left(\frac{5}{2}\right)^2 + 90\left(\frac{5}{2}\right) = 96.875 \text{ m}$$

$$\begin{aligned} \text{Distance between points} &= 96.875 - 54 \\ &= 42.875 \text{ m} \\ &= \underline{42.9 \text{ m}} \end{aligned}$$

$$9) \quad v = 3t^2 - 12t + 5 \quad \begin{array}{l} t=0 \\ s=0 \end{array}$$

$$s = t^3 - 6t^2 + 5t + c \quad \begin{array}{l} s=0 \\ \Rightarrow c=0 \end{array}$$

$$\underline{s = t^3 - 6t^2 + 5t}$$

At 0
 $s=0$

$$0 = t^3 - 6t^2 + 5t$$

$$0 = t(t^2 - 6t + 5)$$

$$0 = t(t-1)(t-5)$$

$$\underline{t \neq 0, \quad t = 1, \quad t = 5}$$

a)

$$b) \quad t=2, \quad s = 2^3 - 6(2)^2 + 5(2) = -6 \text{ m}$$

$$t=3, \quad s = 3^3 - 6(3)^2 + 5(3) = -12 \text{ m}$$

$$-12 - (-6) = -6 \text{ m}$$

so distance = 6 m

$$11) \quad a = t - 3$$

$$a) \quad v = \frac{t^2}{2} - 3t + c \quad \begin{cases} t=0 \\ v=4 \end{cases}$$

$$4 = 0 - 0 + c$$

$$4 = c$$

$$v = \frac{1}{2}t^2 - 3t + 4$$

$$b) \quad \text{At rest } v = 0$$

$$\frac{1}{2}t^2 - 3t + 4 = 0$$

$$t^2 - 6t + 8 = 0$$

$$(t-2)(t-4) = 0$$

$$t = 2 \quad \text{or} \quad t = 4$$

$$c) \quad \text{Distance} = \int_2^4 v \, dt$$

$$= \left[\frac{1}{6}t^3 - \frac{3t^2}{2} + 4t \right]_2^4$$

$$= \left(\frac{1}{6}(4)^3 - \frac{3}{2}(4)^2 + 4(4) \right) - \left(\frac{1}{6}(2)^3 - \frac{3}{2}(2)^2 + 4(2) \right)$$

$$\frac{8}{3} - \frac{10}{3}$$

$$= -\frac{2}{3} \text{ m}$$

$$\text{Distance} = \frac{2}{3} \text{ m}$$
