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 DEPT: BIOMEDICAL ENGINEERING  
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$$1. V = (4t - 3t^2) \text{ms}^{-1}$$

$$ds = v dt$$

$$s = \int v dt$$

$$s = (2t^2 - t^3 + C) \text{m}$$

$$C = 0$$

$$\text{at } t = 0, s = 0$$

At  $t = 0$

when  $t = 4$

$$s = [2t^2 - t^3 + 0]_0^4$$

$$= 2(4)^2 - (4)^3$$

$$= 32 - 64$$

$$= -32 \text{m}$$

∴ It is 32 metres away from the starting point in the opposite direction

$$V = (0.5t^3 - 8t) \text{ms}^{-1}$$

$$a = \frac{dv}{dt} = (1.5t^2 - 8) \text{ms}^{-2}$$

$$\text{at } t = 2 = (1.5(2)^2 - 8) \text{ms}^{-2}$$

$$= (1.5(4) - 8) \text{ms}^{-2}$$

$$a = (6 - 8) \text{ms}^{-2}$$

$$a = -2 \text{ms}^{-2}$$

$$3) a = (4t^2 - 2) \text{ms}^{-2}$$

$$v = \int a dt$$

$$\int (4t^2 - 2) dt =$$

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

$$s = \int v dt$$

$$= \int \left( \frac{4}{3}t^3 - 2t - C \right) dt$$

$$s = \frac{t^4}{3} - t^2 + Ct + A$$

where,  $t = 0, s = -2 \text{m}$

$$s = -2 \text{m}$$

$$\therefore -2 = \frac{(0)^4}{3} - (0)^2 + C(0) + A$$

$$-2 = k$$

$$\therefore k = -2$$

when  $t = 2, s = -20 \text{m}$

$$s = -20 \text{m}$$

$$-20 = \frac{(2)^4}{3} - (2)^2 + C(2) + A$$

$$C = \frac{-20 - \frac{16}{3} + 4}{2}$$

$$C = \frac{-19.33}{2}$$

$$C = -9.67$$

$$s = \frac{t^4}{3} - t^2 - 2at - 9.67t$$

when  $t = 4$ ,

$$S = \frac{(4)^4}{3} - C(4)^4 - \frac{29(4)}{3} - 2$$

$$S = \frac{256}{3} - \frac{116}{3} - 16 - 2$$

$$= \frac{140}{3} - 18$$

$S = 28.7\text{m}$  to the right  
of the origin.

$$4) V = (20 - 0.055^2) \text{ms}^{-1}$$

$$d \cdot d \cdot s = V dv$$

$$a = \frac{V dv}{ds}$$

$$a = V \frac{dv}{ds}$$

$$a = \frac{dv}{ds} (20 - 0.055^2)$$

$$\frac{dv}{ds} = -0.15$$

$$a = V \times -0.15$$

$$a = (-0.15(20 - 0.055^2)) \text{ms}^{-2}$$

$$a = (0.0055^3 - 28) \text{ms}^{-2}$$

when  $s = 15\text{m}$

$$a = 0.005(15)^3 - 2(15)$$

$$= 16.875 - 30$$

$$a = -13.125 \text{ms}^{-2}$$