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Biomedical Engineering

181ENEG08/01b

1) $V = (4t - 3t) \text{ m/s}$
 $v = ds/dt$

$$\int_0^3 ds = \int_0^t (4t - 3t) dt$$

$$\frac{ds}{dt} = \frac{4t^2}{2} - \frac{3t^3}{3} \Big|_0^t$$

$$s = 2t^2 - t^3$$

when $t = 4s$

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

$$s = 32 - 64$$

$$s = -32m$$

\Rightarrow 32m to the left of the origin

2) $a = 4t^2 - 2$

$$v = \int a dt$$

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

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

$$= \int v dt$$

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

$$s = \frac{t^4}{3} - t^2 + \frac{C^2}{2} \quad t = 2s \quad s = 20$$

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

$$\frac{56}{3} = \frac{C^2}{2}$$

$$C^2 = \frac{112}{4^3} \quad C = 6.11$$

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

$$s = \frac{t^4}{3} - t^2 + \frac{56}{3} \quad t = 4s$$

$$s = \frac{4^4}{3} - 4^2 + \frac{56}{3} = \frac{256}{3} = 16 + \frac{56}{3} = \frac{256 - 48 + 56}{3}$$

$$= 71$$

3) $v = (0.5d^3 - 3t) \text{ m/s}$

$$a = \frac{dv}{dt}$$

$$\therefore a = 1.5t^2 - 3$$

where $t = 2s$

$$a = 1.5(2)^2 - 3$$

$$a = 6 - 3 = 3 \text{ m/s}^2$$

4) $v = (20 - 0.05s^2) \text{ m/s}$

at $s = 5$

$$v = 20 - 0.05(5)^2$$

$$v = 20 - (0.05 \times 25)$$

$$v = 20 - 1.25$$

$$v = 18.75 \text{ m/s}$$

$$v = a \cdot t \quad v^2 = 4^2 + 2as$$

$$18.75^2 = 0^2 + (2a \times 15)$$

$$350.625 = 30a$$

$$a = \frac{350.625}{30}$$

$$30$$

$$a = 11.6875 \text{ m/s}^2$$