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MAT no: 18/ENG06/070

DEPARTMENT: MECHANICAL ENG

1.) $v = (4t - 3t^2) \text{ m/s}$

$$v = ds/dt$$

$$ds = v dt$$

$$\int_0^5 ds = \int_0^4 (4t - 3t^2) dt$$

$$s \Big|_0^5 = \frac{4t^2}{2} - \frac{3t^3}{3} \Big|_0^4$$

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

when $t = 4s$

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

$$s = 32 - 64$$

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

$\rightarrow 32 \text{ m}$ to the left of the origin

2.) $a = (4t^2 - 2) \text{ m/s}^2$

when $t = 0s$, $s = -2m$

$t = 2s$, $s = -20m$

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

$$\int_0^4 dv = \int_2^4 (4t^2 - 2) dt$$

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

$$v = ds/dt$$

$$\int_0^3 ds = \int_0^t v dt$$

$$s = \int_0^t \left(\frac{4t^3}{3} - 2t + C \right) dt$$

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

at $t=2$, $s=-20$

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

$$C = \frac{-20 - 1.3}{3} = -7.1$$

\therefore at $t=4s$

$$s = \frac{4^4}{3} - 4^2 + (4 \times -7.1) + 7.1$$

$$s = \frac{256}{3} - 16 - 28.4 + 7.1$$

$$s = 83.8 \text{ m}$$

3.)

$v = (a$

4.)

3.)

$$v = (0.5t^2 - 8t) \text{ m/s}$$

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

$$\therefore a = 1.5t - 8$$

$$\text{where } t = 25$$

$$a = 1.5(25) - 8$$

$$a = 6 - 8 = -2 \text{ m/s}^2$$

4.)

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

$$\text{at } s = 15$$

$$v = 20 - 0.05(15)^2$$

$$v = 20 - (0.05 \times 225)$$

$$v = 20 - 11.25$$

$$v = \underline{\underline{8.75 \text{ m/s}}}$$

Using $v^2 = u^2 + 2as$

$$8.75^2 = 0^2 + (2a \times 15)$$

$$30a = 76.5625$$

$$a = \frac{76.5625}{30}$$

$$a = \underline{\underline{2.55 \text{ m/s}^2}}$$