

Name:

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ENG MECHANICS.

(12-3)

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

to find position:

$$V = \frac{ds}{dt} = (4t - 3t^2)$$

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

$$s \Big|_0^s = 2t^2 - t^3 \Big|_0^t$$

$$s = 2t^2 - t^3 \text{ when } t = 4 \text{ secs.}$$

$$s = 2(4)^2 - (4)^3 = 2(16) - 64$$

$$s = 32 - 64$$

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

(12-4)

2. $V = (0.5t^3 - 8t) \text{ m/s}$ to find acceleration.

$$a = \frac{dv}{dt} = (3 \times 0.5)t^2 - 8$$

$$a = 1.5t^2 - 8$$

$$a = 1.5(2)^2 - 8 \quad a = (1.5 \times 4) - 8$$

$$a = 6-8 \quad a = -2 \text{ m/s}^2 \text{ (deceleration)}$$

(12.7)

3.

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

$$\text{When } t=0 \quad s=2 \text{ m}$$

$$\text{" } t=2 \text{ secs, } s=20 \text{ m.}$$

$$t=4 \text{ secs, } s=2$$

$$a = 4t^2 - 2 \quad \therefore v = \int a dt$$

$$v = \int_0^t (4t - 2) dt \quad \therefore v = \frac{4t^3}{3} - 2t + C \text{ m/s.}$$

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

$$s = \frac{1}{4} \cdot \frac{4t^4}{3} - \frac{2t^2}{2} + Ct + A$$

$$s = \frac{1}{3} t^4 - t^2 + Ct + A$$

$$\therefore \text{When } t=0 \quad s=2$$

$$\therefore -2 = \frac{1}{3} (0)^4 - (0)^2 + C(0) + A$$

$$\therefore A = -2$$

$$\text{When } t=2, \quad s=20$$

$$-20 = \frac{1}{3} (2)^4 - (2)^2 + C(2) - 2$$

$$-20 = 5.83 - 4 + 2c - 2$$

$$-20 = 5.83 - 4 - 2 + 2c$$

$$-20 = 0.67 + 2c$$

$$2c = -20 + 0.67$$

$$c = \frac{-19.33}{2} = -9.665$$

∴ The general equation;

$$S = \frac{1}{3}t^3 - t^2 - 9.665t - 2$$

When $t = 4$ sec $S = ?$

$$\therefore S = \frac{1}{3}(4)^3 - (4)^2 - 9.665(4) - 2$$

$$S = 85.333 - 16 - 38.66 - 2$$

$$S = 28.673 \text{ m}$$

(2.8)

4.

$$Q = v \left(\frac{dv}{ds} \right) \quad v = (20 - 0.05s^2) \text{ m/s}$$

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

ds

$$\Rightarrow (20 - 0.05s^2)(0.15)$$

$$s = 16 \text{ m}$$

$$a = (20 - 0.05s^2)(-0.15)$$

$$s = 16 \text{ m} \quad a = (20 - 0.05(16)^2)(-0.15)$$

$$= (20 - 11.25)(-0.15) = 8.75(-0.15)$$

$$a = -13.125 \text{ m/s}^2$$