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DEPT: COMPUTER ENGINEERING

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MECHANICS ASSIGNMENT

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1. F12-3,

Solution
 $v = (4t - 3t^2) \text{ m/s}$ $t = 0, s = 0, t = 4$

$$v = \frac{ds}{dt}$$

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

$$= \left(\frac{4t^2}{2} - \frac{3t^3}{3} \right)_0^4$$

$$s = \left(2t^2 - t^3 \right)_0^4$$

$$s = (2(4)^2 - (4)^3) - (0)$$

$$s = 32 - 64$$

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

The position is from the left of the origin

2. Fig F12-4

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

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

$$a = (1.5t^2 - 8) \text{ m/s}^2$$

$$\text{at } t = 2 \text{ s}$$

$$= 1.5(2)^2 - 8$$

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

It means that the particle
decelerates from its possible

Q F12-7

$$a = (4t^2 - 2) \quad \text{solution}$$

$$a = \frac{dv}{dt} = (4t^2 - 2)$$

$$\int dv = \int \left(\frac{4t^3}{3} - 2t + c_1 \right) dt \text{ m/s}$$

$$\frac{ds}{dt} = \frac{4t^3}{3} - 2t + c_1$$

$$\int ds = \int \frac{4t^3}{3} dt$$

$$\int ds = \frac{4t^4}{3 \times 4} - \frac{2t^2}{2} + c_1 + c_2 \text{ m}$$

$$s = \frac{1}{3}t^4 - t^2 + c_1t + c_2$$

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

$$-2 = \frac{1}{3}(0)^4 - (0)^2 + c_1(0) + c_2$$

$$c_2 = -2$$

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

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

$$2c = -19.33$$

$$c = -9.67$$

$$At + t = 4s, \quad s = ?$$

$$s = \frac{1}{3}(4)^4 - (4)^2 - 9.67(4) - 2$$

$$s = 256 - 56.668$$

$$s = 200 \text{ m}$$

So the position is positive in the particle

Ex 2-9

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

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

$$\frac{dv}{ds} = -1.5$$

$$a = (20 - 0.05s^2)(-1.5)$$

$$a = (20 - 11.25)(-1.5)$$

$$a = (8.75)(-1.5)$$

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

$$a = -13.13 \text{ m/s}^2$$

It means the particle is decelerating