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ELECTRICAL ENGINEERING
18/MHS01/322
ENG234

1. $v = (4t - 3t^2)$ m/s $t = 0, s = 0, t = 4$

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

$\therefore ds/dt = (4t - 3t^2)$

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

$s = \left[\frac{4t^2}{2} - \frac{3t^3}{3}\right]_0^4$

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

$s = [2t^2 - t^3]_4$

$\therefore s = [2t^2 - t^3]_4 - [2t^2 t^3]_0$

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

$s = -32m$ $\therefore s = 32m$

That means the position of the particle is to the left of the origin.

2. $v = (0.5t^3 - 8t)\,m/s$, $t = 2$, $a = ?$

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

$$a = d/dt\,(0.5t^3 - 8t)$$

$$a = (1.5t^2 - 8)\,m/s^2$$

at $t = 2s$

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

$$= (1.5 \times 4) - 8 = -2\,m/s^2$$

∴ This implies that the particle is decelerating

3. $a = (4t^2 - 2)$

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

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

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

$$v = \frac{(4t^3}{3} - 2t + c)\,m/s$$

$$\therefore v = \frac{ds}{dt} = \left(\frac{4t^3}{3} - 2t + G\right) m/s$$

$$ds/dt = (4/3t^2 - 2t + G)$$

$$\int dv = \int (4/3 t^3 - 2t + c)\, dt$$

$$s = \left(\frac{4t^4}{3\times 4} - \frac{2t^2}{2} + c_1 + c_2\right) m$$

$$s = 1/3\, t^4 - t^2 + c_1 + c_2$$

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

$$s = 1/3 t^4 - t^3 + c_1 + c$$

$$-20 = 1/3 (2)^4 - (2)^2 + c_1 (2) \cdot 2$$

$$-20 = 16/3 - 4 + 2c_1 - 2$$

$$-20 = -2/3 + 2c_1$$

$$2c_1 = -20 + 2/3$$

$$2c_1 = -19.33$$

$$c_1 = -19.33/2 = -9.67$$

$$\therefore c_1 = -9.67$$

$$c_2 = -2$$

$$\therefore s = 1/3 t^4 - t^3 + c_1 t + c_2$$

$$s = 1/3 t^4 - t^3 - 9.67 t - 2$$

$$s = \frac{256}{3} - 16 - 38.6668 \cdot 2$$

$$s = \frac{0.256}{3} - 8.6668$$

$$s = 26.667 \quad \therefore \text{The position of the particle is } 26.667$$

4. $v = (20 - 0.05s^2)$

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

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

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

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

$$\therefore a = (30 - 0.05s^2)(-0.15)$$

At $s = 15m$

$$a = (20 - 0.05(15)^2)(-0.1(15))$$

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

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

$$a = -13.125 m/s^2$$

$$a = -13.13 m/s^2$$

∴ The acceleration of the particle at $s = 15m$ is $-13.125 m/s^2$ which implies that the particle is decelerating