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18/ENG04/078

Electrical/Electronics Engineering.

Assignment.

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

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

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

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

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

$$\int = [2t^2 - t^3]_0^4$$

$$\int = [2t^2 - t^3]^4 - [2t^2 t^3]\ 0$$

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

$$S = 32 - 64$$

$$S = -32m \ \therefore\ S = 32m$$

∴ this means that the position of the particle is to the left of the Origin

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

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

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

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

o

at $t = 2s$

$= 1.5(2)^2 - 8$

$= (1.5 \times 4) - 8$

$= -2 m/s^2.$

That implies that the particle is decelerating.

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

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

$dv/dt = (4t^2 - 2)$

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

$v = \left(\frac{4t^3}{3} - 2t + C_1\right) m/s$

$v = \frac{ds}{dt} = \left(\frac{4t^3}{3} - 2t + c_1\right)$

$\int ds = \int \left(\frac{4}{3}t^3 - 2t + C_1\right) dt$

$S = \frac{(4t^4)}{3 \times 4} - \frac{2t^2}{2} + C_1 + C_2)m$

$S = \frac{1}{3}t^4 - t^2 + C_1 t + C_2 //$

At $t = 0_3$, $S = -2m$

$= S = \frac{1}{3}t - t^2 + C_1 + C_2$

$-2 = \frac{1}{3}(0)^4 - (0)^2 + C_1(0) + C_2$

$\therefore C_2 = -2//$

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

- $S = \frac{1}{3}t^4 - t^2 + C_1 t - 2$

$$-20 = \frac{1}{3}(2)^4 - (2)^2 + C_1(2) - 2$$

$$-20 = \frac{16}{3} - 4 + 2C_1 - 2$$

$$-20 = \frac{-2}{3} + 2C_1$$

$$2C_1 = -20 + \frac{2}{3}$$

$$2C_1 = -19.33$$

$$C_1 = \frac{-19.33}{2}$$

$$C_1 = 9.67$$

$$C_1 = -9.67$$

$$C_2 = -2$$

$$S = \frac{1}{3}t^4 - t^2 + C_1 + C_2$$

$$S = \frac{1}{3}t^4 - t^2 - 9.67t - 2$$

At $t = 4s$ $S = ?$

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

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

$$s = \frac{256}{3} - 56.6668$$

$$\therefore s = 28.667m$$

The position of the particle is 28.67m.

4. $v = (20 - 0.055^2)$, $a = dv/dt = dv/ds \times ds/dt$

$$= dv/ds \times v$$

$$a = \frac{v\,dv}{ds}, \frac{dv}{ds} = -0.15$$

$$a = (20 - 0.055s^2)(-0.15)$$

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 partica at $s = 15m$ is $-13.125m$ which implies that the particle is decelerating.