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19/ENG03/032
CIVIL ENGINEERING
ENG 234

1. $V = (4t - 3t^2)$ m/s

determine the position at time $t = 4s$.

$V = 4t - 3t^2$

$S = \int V = \int 4t - 3t^2 \, dt$

$S = 2t^2 - t^3 + C$

At $t = 0$, $S = 0$.

$0 = 2(0)^2 - (0)^3 + C$

$C = 0$.

$S = 2t^2 - t^3$

At $t = 4s$

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

$S = -32m$

The negative sign shows the particle is moving to the left of its original position

2. $V = 0.5t^3 - 8t$

$a = \frac{dv}{dt} = 1.5t^2 - 8$

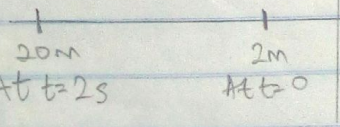
At time $t = 2s$

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

$a = -2 m/s^2$

The negatives sign shows that the particle is decelerating.

3.



$a = (4t^2 - 2) m/s^2$

$V = \int a = \int 4t^2 - 2 \, dt$

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

$$S = \int V = \int \frac{4}{3}t^3 - 2t + C_1 \, dt$$

$$S = \frac{4t^4}{3} - t^2 + C_1 t + C_2 \quad \text{---(ii)}$$

When $t = 0$, $S = 2$

Putting this in eqtn (ii)

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

$$2 = C_2$$

$\therefore C_2 = 2$

put this in eqtn (ii)

When $S = 20$, $t = 2$.

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

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

$$2C_1 = \frac{50}{3}$$

$$2C_1 = \frac{25}{3}$$

$\therefore$ the equation becomes.

$$S = \frac{t^4}{3} - t^2 + \frac{25t}{3} + 2$$

When $t = 4$

$$S = \frac{(4)^4}{3} - (4)^2 + \frac{25(4)}{3} + 2.$$

$$S = 104.67\text{m}$$

4. $V = 20 - 0.05S^2$

$$a = \frac{dv}{dt} = -0.015\text{m/s}^2$$

at $S = 15$

$$a = -0.01 \times 15$$

$$= -1.5\text{m/s}^2$$

The negative sign means the particle is decelerating.