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Course: ENG 234 [Mechanics]

Assignment

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

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

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

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

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

$S = \left[2t^2 - t^3\right]^4 - \left[2t^2 - t^3\right]^0$

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

$S = 32 - 64$

$S = -32$m $\therefore S = 32$m left of the origin

$\therefore$ This means that the position of the particle is to the left of the o

2) $V = (0{\cdot}5t^3 - 8t)$ m/s

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

$a = \frac{d}{dt}(0{\cdot}5t^3 - 8t)$

$a = (1{\cdot}5t^2 - 8)$ m/s^2

at $t = 2$s

$= 1{\cdot}5(2)^2 - 8$

$(1{\cdot}5 \times 4) - 8$

$= -2$ m/s^2

$\therefore$ This implies that the particle is decelerating.

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

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

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

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

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

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

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

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

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

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

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

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

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

$\therefore C_2 = -2$

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

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

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

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

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

$$2C_1 = -19.33$$

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

$$= -9.67$$

$\therefore C_1 = -9.67$

$C_2 = -2$

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

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

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

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

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

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

$S = 28.667m$

$\therefore$ The possible The position of the particle is 28.67m

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

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

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

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

$\therefore a = (20 - 0.055^2)(-0.15)$

At $s = 15m$

$a = (20 - 0.05(15)^2)(-0.15(15))$

$a = (20 - 11.25)(-2.25)$

$a = -19.687 m/s^2$

$a = -19.687 m/s^2$

$\therefore$ The acceleration of the particle at $s = 15m$ is $-19.687 m/s^2$ implies that the particle is decelerating.