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ELECT/21ECT

18/ENG04/1032

ENG 234.

Assignment.

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

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

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

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

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

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

$s = [2t^2 - t^3]^4 - [2t^2 - t^3]^0$

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

$s = 32 - 64$

$s = -32m$

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

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

At $t = 2s$.

$= 1.5(2)^2 - 8$

$= (1.5 \times 4) - 8$

$= -2 m/s^2$

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

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

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

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

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

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

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

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

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

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

$s = \frac{1}{3}t^4 - t^2 + c_1 t + c_2$

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

$\therefore s = \frac{1}{3}t - t^2 + c_1 t + c_2$

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

$\therefore c_2 = -2$

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

$s = \frac{1}{3}t^4 - t^2 + c_1 t - 2$

$-20 = \frac{1}{3}(2)^4 - (2)^2 + c_1(2) - 2$

$-20 = \frac{16}{3} - 4 + 2c_1 - 2$

$-20 = \frac{-2}{3} + 2c_1$

$\therefore 2c_1 = -20 + \frac{2}{3}$

$2c_1 = -19.33$

$c_1 = -19.33/2$

$c_1 = -9.67$

$\therefore c_1 = -9.67$

$c_2 = -2$

$\therefore s = \frac{1}{3}t^4 - t^2 + c_1 t + c_2$

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

At $t = 4s$, $s = ?$

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

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

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

$s = 28.667m$

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

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

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

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

$\frac{dv}{ds} = -0.1s$

$\therefore a = (20 - 0.05s^2)(-0.1s)$

At $s = 15m$

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

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

$a = (8.75)(-1.5)$

$a = -13.125 m/s^2$

$a = -13.13 m/s^2$

$\therefore$ The acceleration of the particle at $s = 18m$

is $-13.125 m/s^2$ which implies that the particle is decelerating.