MARIA O-I MORPH-EFEBERI
15/ENG04/051
ELECT/ELECT
ENG 234 ASSIGNMENT.

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

When $t = 4$, $s = 0$ & $t = 0$

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

$ds = \int v\,dt$

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

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

$= [2t^2 - t^3 + C]_0^4 + C$

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

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

$= 32 - 64 - [0]$

$s = -32m$

The position of the particle to the left of the origin

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

When $t = 2s$ & $a = ?$

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

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

$= \frac{d}{dt}(1.5t^2 - 8)$

$t = 2$

$= 1.5(2)^2 - 8$

$= -2\ m/s^2$

This shows that the particle is decelerating.

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

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

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

$= \left[\frac{4t^3}{3} - \frac{2t}{1}\right] + c$

$v = \frac{ds}{dt} = \left[\frac{4t^3}{3} - 2t + c\right]$

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

$= \left[\frac{4t^4}{3\times 4} - \frac{2t^2}{2} + C_1 t + C_2\right]$

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

When $t = 0$ s, $s = 2$m which is at the left side of the origin $\therefore s = -2$ m.

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

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

$-2 = C_2$

$C_2 = -2.$

When $t = 2$ s, $s = 20$m which is the left side of the origin $\therefore s = -20$m

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

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

$-20 = 16/3 - 4 + 2C_1 - 2$

$-20 = -9/3 + 2C_1$

$2C_1 = -20 - (-3)$

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

$C_1 = -9.67$

When $t = 4s$ and $S = ?$

$$S = \frac{1}{3}t^4 - t^2 - 9.6t - 2$$

$$= \frac{1}{3}(4)^4 - (4)^2 - 9.6(4) - 2$$

$$= 256/3 - 16 - 38.667 - 2$$

$$= 85.6/3 - 56.667$$

$$= 28.666\,m.$$

$$S = 28.67\,m/s.$$

4. $V = (20 - 0.05S^2)\,m/s$

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

$$\frac{dv}{ds} = (20 - 0.05S^2)$$

$$\frac{dv}{ds} = -1.05$$

$$= (20 - 0.05S^2)(-1.05)$$

When $S = 15\,m$

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

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

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

$$= -13.125\,m/s^2.$$

The acceleration of the particle when $S = 15m$ is $-13.125\,m/s^2$