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Mechanical Engineering
Eng 234

1) FIG 12-3(1)

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

$v = \frac{ds}{dt}$

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

$\int_{t_1}^{t_2} (4t - 3t^2)dt$

$= \int_{s_1}^{s_2} ds$

$\left[\frac{4 \times t^2}{2} - \frac{3 \times t^3}{3}\right]_{t_1}^{t_2} = [s]_{s_1}^{s_2}$

$[2 \times t^2 - t^3]_4^0 = S_2 - 0$

$S_2 = [2 \times 4^2 - 4^3] + 0$

$S_2 = 32m$

2) Fig 12-4

$v = 0.5t^3 - 8t$

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

$a = 1.5t^2 - 8$

$t = 2$

$a = -2 m/s^2$

$=$

3) Fig 12-7

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

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

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

$$s = \int \left(\frac{1}{3}t^3 - 2t + C_1\right) dt$$

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

at, $t = 0$, $s = -2 = C_2$

at, $t = 2$, $s = -20$, $C_1 = -9.70$

at, $t = 4$

$$s(4) = \frac{1}{3}(4)^4 - (4)^2 + (-2)(4) + (-9.7)$$

$$= 28.7\,m.$$

4) Fig 12 - 8

$v = (20 - 0.05s^2)\ m/s$

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

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

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

$dv = -2 \times 0.05 s\, ds$

$= 0.1$

$dv = -2 \times 0.05 s\, ds$

$= 0.1s\, ds$

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

$a = -2s + 0.005s^3$

$a(s = 15) = -2 \times 15 + 0.005 \times 15^3$

$a = 13.125\,m/s^2$