1) Figure 12.3(1)

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

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

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

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

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

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

$[2 \times t^2 - t^3]_{-1}^{4} = S_2 - 0$

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

$S_2 = -32m$

2) Figure 12-4

$v = 0.5t^3 - 8t$

$a = dv/dt$

$a = 1.5t^2 - 8$

$t = 2$

$a = -2 m/s^2$

3) Fig 12-7

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

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

$v \rightarrow \left(\frac{4}{3}t^2 - 2t - 6\right)$

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

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

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

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

at $t = 4$

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

$= 28.7m$

4) Fig 12-8

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

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

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

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

$dv = 0.05s \times 2ds$

$= 0.1s\,ds$

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

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

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

$a = -13.125 m/s^2$