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18/ENG03/038
Civil Engineering

1) $V = (4t - 3t^2)\,ms^{-1}$, $S = \int V dt$

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

When $t = 4$

$$S = 2(4) - (4)^3$$
$$= -32m$$

2) $V = (0.5t^3 - 8t)\,ms^{-1}$

$A = dv/dt$

$$dv/dt = 3(0.5)t^2 - 8$$
$$= 1.5t^2 - 8$$

$$A = dv/dt\,|_{t=2}$$

$$= 1.5(2)^2 - 8 = 6 - 8$$
$$= -2\,ms^{-1}$$

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$V = (20 - 0.5s)\,ms^{-1}$

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

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

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

$\frac{dv}{ds} = -0.1s$, $\frac{ds}{dt} = (20 - 0.5s^2)$

$A = (-0.1s)(20 - 0.05s^2)$

when $s = 15$

$A = (-0.1 \times 15)(20 - 0.05(15^2))$

$A = -13.125\,ms^{-2}$

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$(t^2 - 2)\ ms^{-2}$

$\int A\,dt$

$\int 4t^2 - 2$

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

$S = \int v\,dt$

$= \int \frac{4t^2}{3} - 2t + C$

$= \frac{4t^3}{12} - \frac{2t^2}{2} + Ct$

$P = \frac{1}{3}t^4 - t^2 + Ct + k$

When $t = 0$, $P = 2$

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

$k = -2$

when $t = 2$, $P = 20$, $k = -2$

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

$-20 = -0.7 + 2C$

$C = -9.7$

$P = \frac{1}{3}t^4 - t^2 - 9.7t - 2$

when $t = 4$

$P = \frac{1}{3}(4)^4 - 4^2 - (9.7 \times 4) - 2$

$P = 28.7m$