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16/ENG06/005
Mechanical Engineering
ENG 234

(1) For Figure 12.3 (1)

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

$s = \int v\,dt$

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

$= 2t^2 - t^3$

When $t = 4$

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

$= 32 - 64$

$s = -32$ m//

(2) For Figure 12.4 (2)

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

$A = dv/dt$

$\frac{dv}{dt} = 3(0.5)t^2 - 8$

$= 1.5t^2 - 8$

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

$= 1.5(2)^2 - 8$

$= 6 - 8 = -2$ m/s//

(3) For Figure 12.7 (3)

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

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

$s = \int v\,dt$

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

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

$P = 1/3t^4 - t^2 + ct + k$

Where $t = 0, P = 2$

$-2 = 1/3(0)^4 - (0)^2 + c(0) + k$

$k = -2$

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

$-20 = 1/3(2)^4 - 2^2 + c(2) - 2$

$-20 = -0.7 + 2c$

$c = -9.7$

$P = 1/3t^4 - t^2 - 9.7t - 2$

When $t = 4$

$P = 1/3(4)^4 - 4^2 - (9.7 \times 4) - 2$

$P = 28.7$ m//

(4) For Figure 12.8 (4)

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

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

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

$\frac{dv}{ds} = -0.1s$, $\frac{ds}{dt} = (20 - 0.05s^2)$

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

When $s = 15$

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

$A = -13.125$ m/s^2