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MECHANICAL ENG

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

The position is gotten by integrating

$v = 4t - 3t^2$

$s = \int 4t - 3t^2$

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

$= 2t^2 - t^3 + c$

at $t = 0$ $s = 0$

$0 = 2(0) + 0^3 + c$

$\therefore c = 0$

at $t = 4$

$s = 2(4)^2 - (4)^3 + 0$

$= 32 - 64$

$s = -32m$

2) $v = 0.5t^3 - 8t$

go differentiate

$a = \frac{dv}{dt} = 0.5t^2 - 8$

$t = 2$

$a = 1.5(2)^2 - 8$

$= -2 m/s$

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

at $t = 0$

$= -2 ms^{-2}$

at $t = 2$

$= -20 ms^{-2}$

to get the position of particle at $t = 0$ s

$v = \int 4t^2 - 2$

$v = \frac{4t^3}{3} - 2t + 4_0$

to get position

$d = \int \frac{at^3}{3} - 2t$

$= \frac{1}{3} t^3 - t^2 + V_0 t + d_0$

$at^3 + 2v$

$-2 = d_0$

$d_0 = -2m$

to get position at $t = 4s$

$d = -20$ at $t = 2$

$-20 = \frac{2^4}{3} - 2^2 + 2V_0 - 2$

$\frac{-58}{3} = 2V_0$

$V_0 = \frac{-58}{6} = \frac{-29}{3} ms^{-1}$

at $t = 4$

$d = 28.66m$

4 $v = 20 - 0.05s^2$

When $s = 15m$

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

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

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

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

$\frac{dv}{ds} = -0.15 \times (20 - 0.05s^2)$

$= 14.88 \, ms^{-2}$