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Computer Engineering

① $v = (4t - 3t^2) \text{ ms}^{-1}$
 $s = \int v dt$
 $s = \int (4t - 3t^2) dt$
 $= 2t^2 - t^3$

When $t = 4s$
 $s = 2(4)^2 - (4)^3$
 $= 32 - 64 = -32 \text{ m}$

$-20 = \frac{1}{3}(2)^4 - 2^2 + C(2) - 2$
 $-20 = -0.7 + 2C$
 $C = -9.7$
 $P = \frac{1}{3}t^4 - t^2 - 9.7t - 2$

When $t = 4$
 $P = \frac{1}{3}(4)^4 - 4^2 - (9.7 \times 4) - 2$
 $P = 28.7 \text{ m}$

② $v = (0.5t^3 - 8t) \text{ ms}^{-1}$
 $a = \frac{dv}{dt}$
 $\frac{dv}{dt} = (3)(0.5)t^2 - 8$
 $= 1.5t^2 - 8$
 $a = \frac{dv}{dt} = 2$
 $= (1.5)(2)^2 - 8$
 $= -2 \text{ ms}^{-2}$

④ $v = (20 - 0.5s) \text{ ms}^{-1}$
 $\frac{dv}{dt} = \frac{dv}{ds} \times \frac{ds}{dt}$
 $a = \frac{dv}{dt}$, $\frac{dv}{ds} = \frac{dv}{ds} \times \frac{ds}{dt}$
 $\frac{dv}{ds} = -0.15$, $\frac{ds}{dt} = 20 - 0.5s$

$a = (-0.15)(20 - 0.5s)$
 When $s = 15$
 $a = (-0.15)(20 - 0.5(15))$
 $a = -13.125 \text{ ms}^{-2}$

③ $a = (4t^2 - 2) \text{ ms}^{-2}$
 $v = \int a dt$
 $v = \frac{4t^3}{3} - 2t + C$
 $s = \int v dt$
 $= \int (\frac{4t^3}{3} - 2t + C) dt$
 $= \frac{4t^4}{12} - \frac{2t^2}{2} + Ct + K$
 $P = \frac{1}{3}t^4 - t^2 + Ct + K$

When $t = 0$, $P = 2$
 $-2 = \frac{1}{3}(0)^4 - (0)^2 + C(0) + K$
 $K = -2$
 When $t = 2$, $P = 20$, $K = -2$