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Mechatronics Engineering
18/SCI09/001
ENGINEERING Mechanics

1.) Given that

$S = 0.5t^2 m$

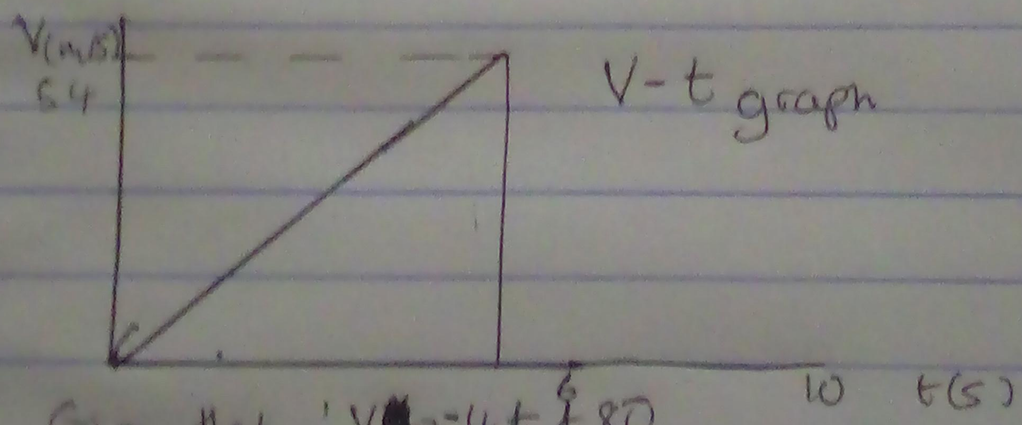
$V \frac{ds}{dt}$, $V_t = 1.5t$

So at $t = 6$

$V = 1.5(6)^2 = 54 m/s$

$S_t = 108m$

$V = \frac{ds}{dt} = 0$ $V = 0 m/s$



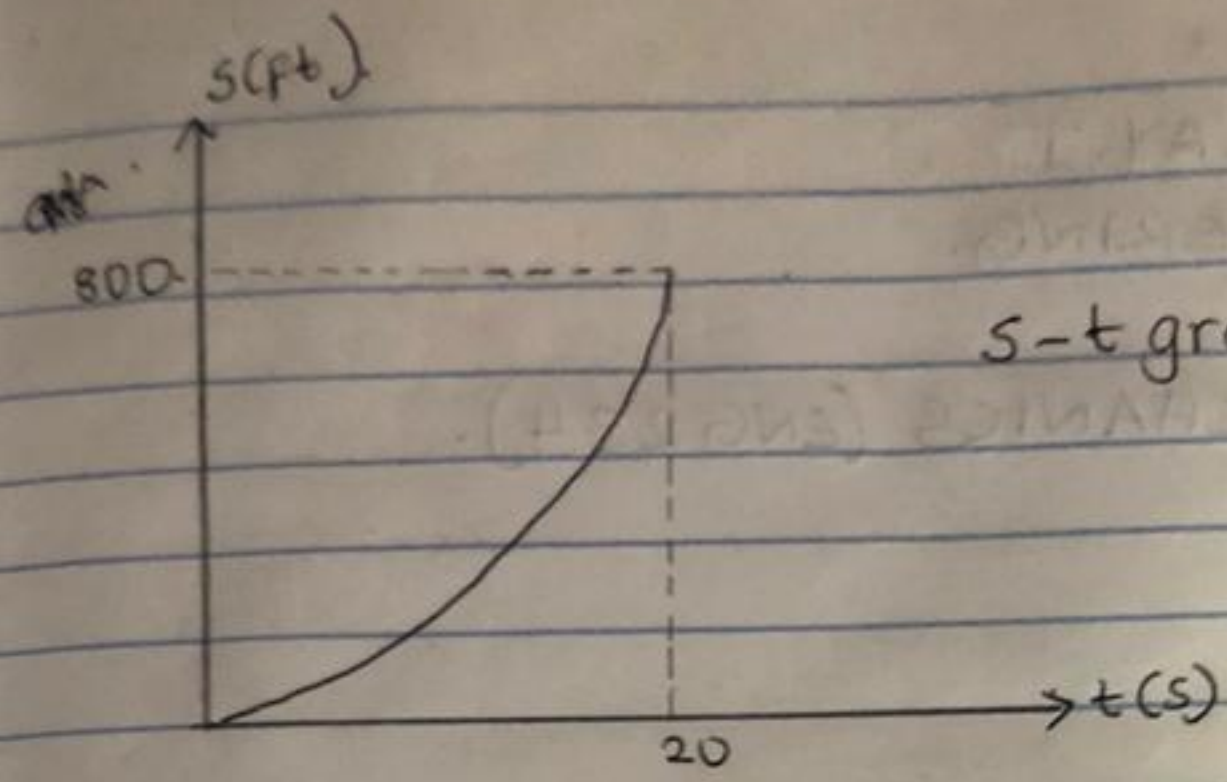
2) Given that : $V = -4t + 80$

$S = \int V dt$, $S = \int_0^{20} -4t + 80 dt$

$S = [-2t^2 + 80t]\Big|_0^{20}$

$\therefore$ at $t = 20$, $S = [-2(20)^2 + 80(20)]$

$S = -800 + 1600$, $S = 800 ft$

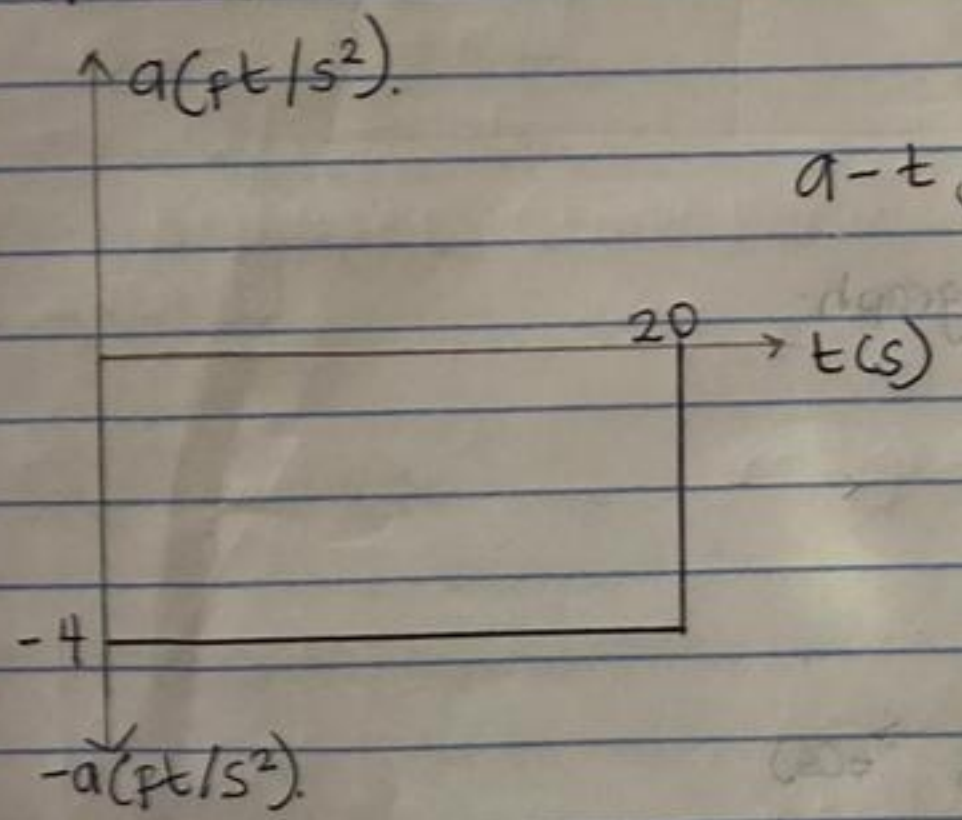


s-t graph.

$v = (-4t + 80)$ ft/s.

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

$a = -4$ ft/s^2



a-t graph.

3.) $v = (0.25s)$ m/s.

$a = v\left(\frac{dv}{ds}\right)$

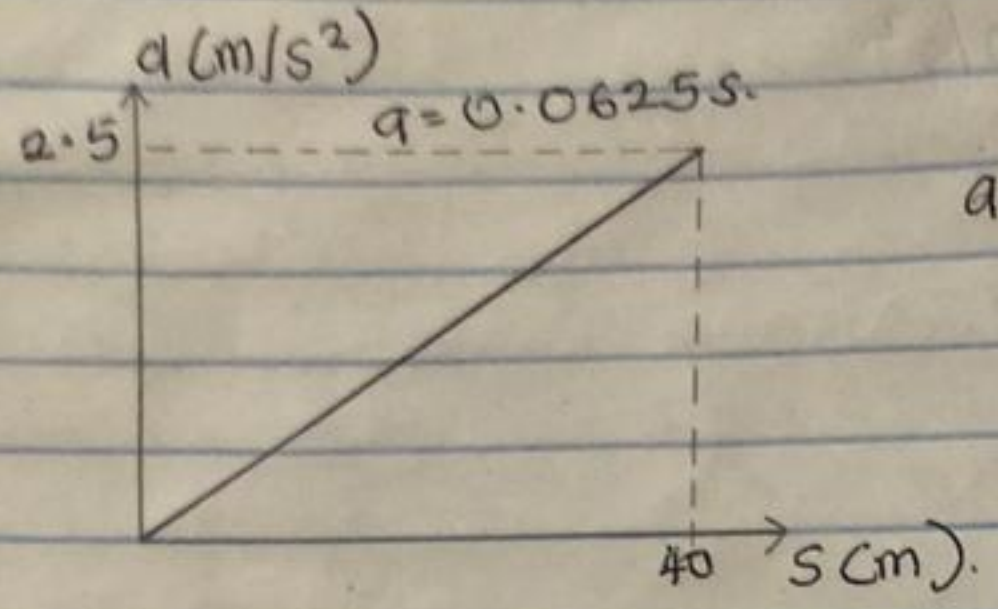
$a = 0.25s(0.25)$

$a = (0.0625s)$ m/s^2.

At $s = 40$m.

$a = (0.0625 \times 40)$

$a = 2.5$ m/s^2.



a–s graph.

4.) $s = 3t^2$.

$V = 6t$.

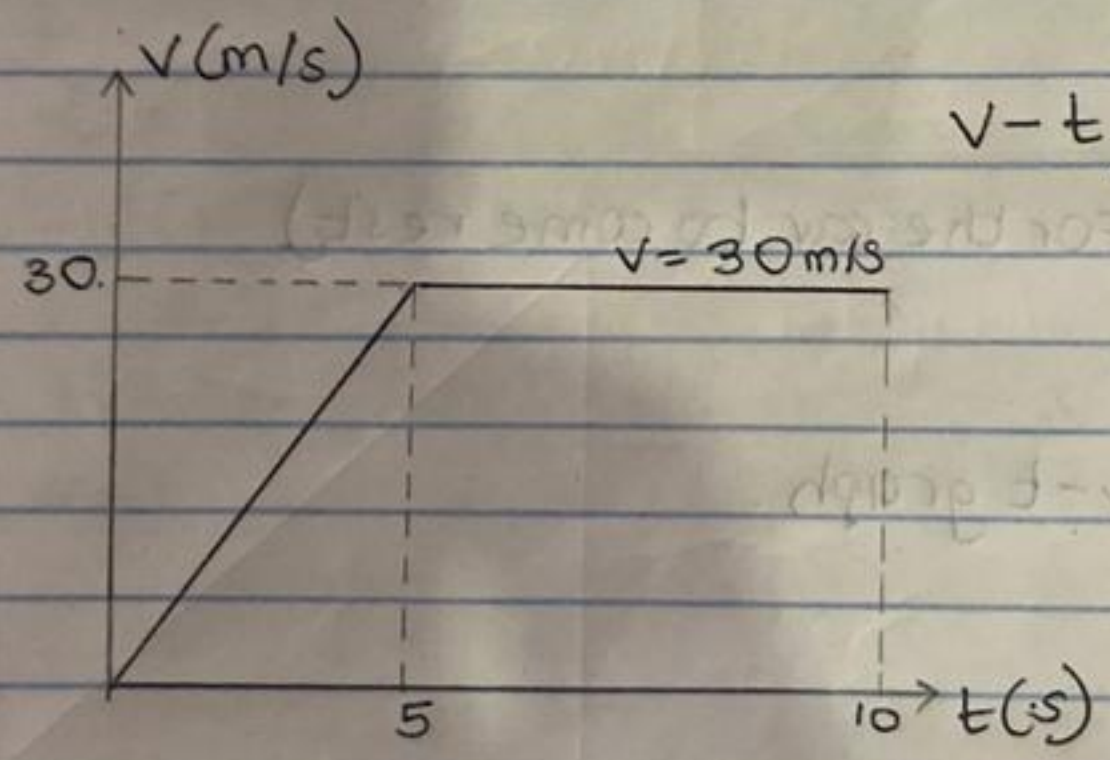
At $t = 5$.

$V = 6 \times 5$.

$V = 30 m/s$.

$S = 30t - 75$

$V = 30 m/s$.



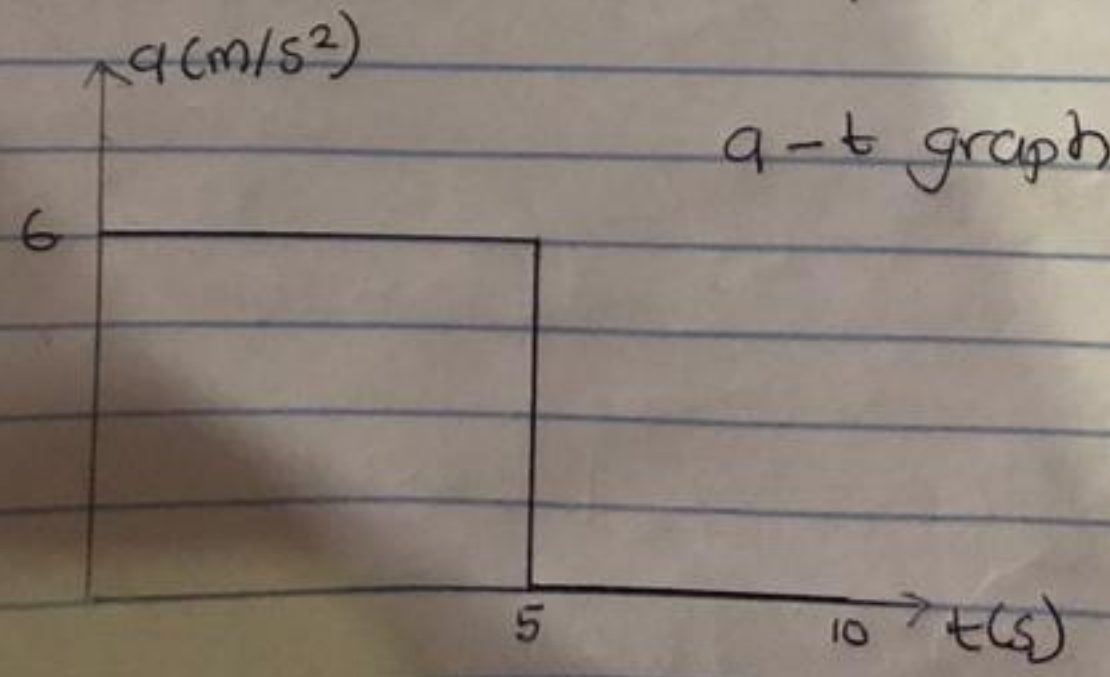
V–t graph

$V = (6t) m/s$.

$a = 6 m/s^2$

$V = 30 m/s$

$a = 0 m/s^2$.



a–t graph.

5.) $a = 20 m/s^2$ $\quad a = -10 m/s^2$

$\int dv = \int a \cdot \delta t$

$\int_0^v \delta v = \int_0^t 20 \cdot \delta t$

$v = 20t$

At $t = 5s$.

$v = 100 m/s$

$\int_{100}^v dv = \int_5^t -10 \cdot \delta t$

$v - 100 = -10(t-5)$

$v - 100 = -10t + 50$

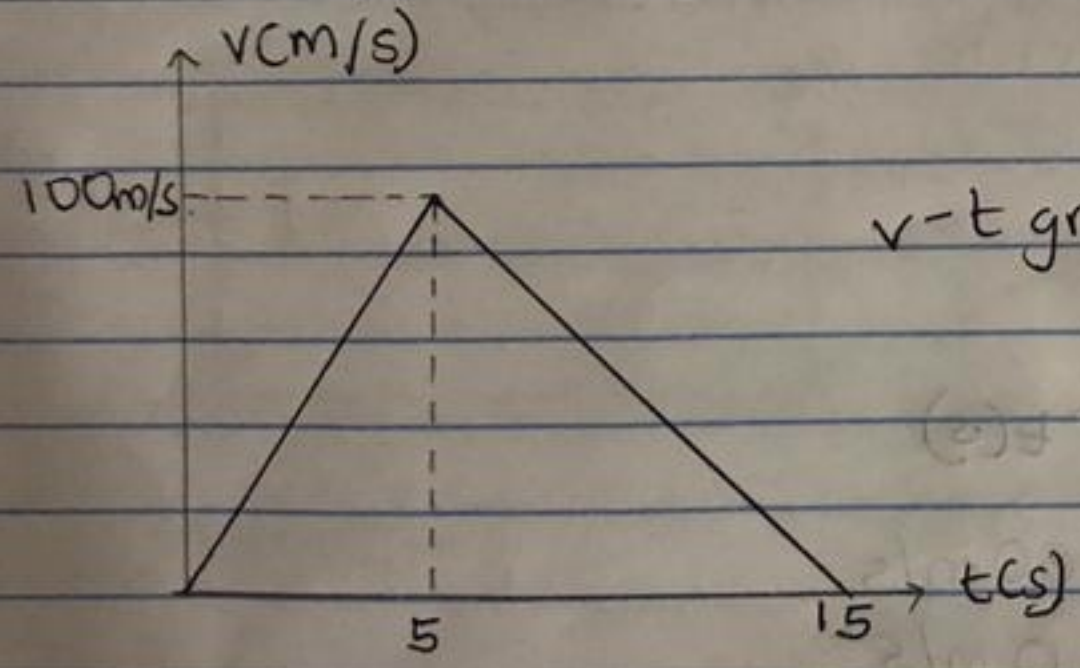
$v = (-10t + 150) m/s$.

At $v = 0$

$0 = -10t + 150$

$-150 = -10t$

$t = 15 sec$ (time for the car to come rest)



v-t graph.

6.) $v = 30t$

$\int ds = \int v dt$

$\int_0^s \delta s = \int_0^t (30t) dt$

$s = 15t^2$

At $t = 5s$.

$s = 15(5)^2$

$s = 375 m$.