ONOSENI ~~AL-AMEEN~~ TOMIWA
COMPUTER ENGINEERING
19/ENG02/081
ENG. MECHANICS

1) Given that

$s = 0.5t^3 m$

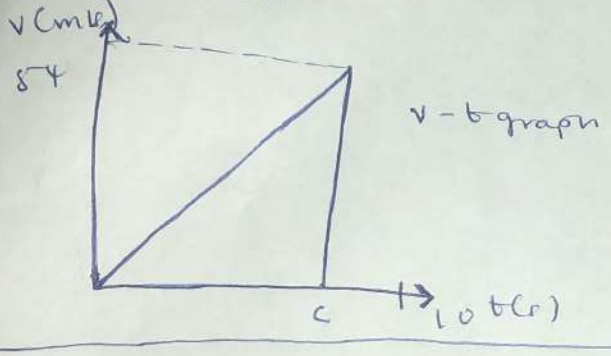
$\frac{ds}{dt}, \quad v = 1.5t^2$

at $t = 6$

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

$s_2 = 108 m$

$v = \frac{ds}{dt} = 0, \quad v = 0$



v-t graph

2) Given that

$v = -4t + 80$

$s = \int v\,dt$

$s = \int_0^{20} -4t + 80\,dt$

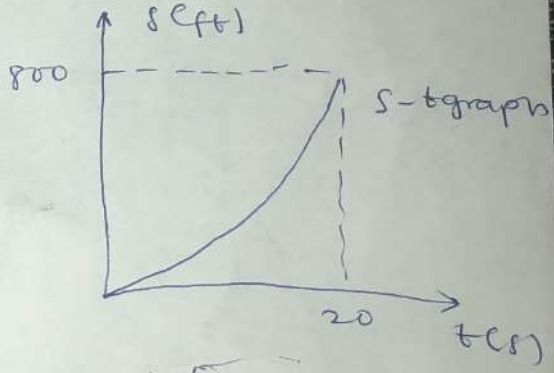
$s = [-2t^2 + 80t]_0^{20}$

at $t = 20$

$s = (-2(20)^2 + 80(20))$

$s = -800 + 1600$

$s = 800 ft$

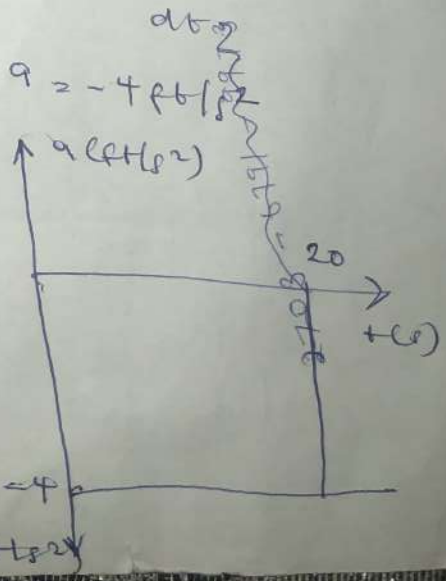


s-t graph

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

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

$a = -4 ft/s^2$



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

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

$a = 0.25s(0.25)$

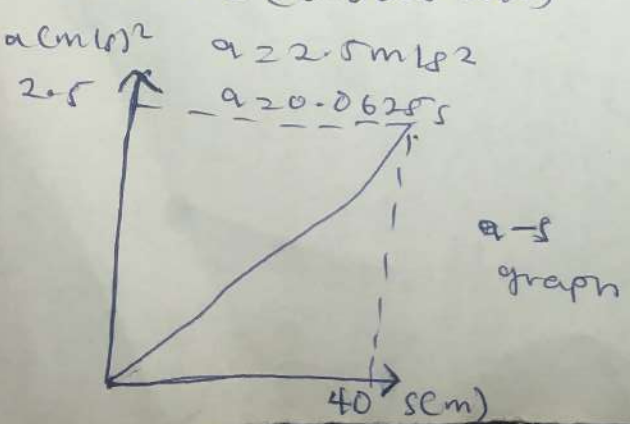
$a = (0.0625s) m/s^2$

at $s = 40m$

$a = (0.0625 \times 40)$

$a = 2.5 m/s^2$

$a = 0.0625s$



a-s graph

$S = 30t - 75$

$V = 30 m/s$

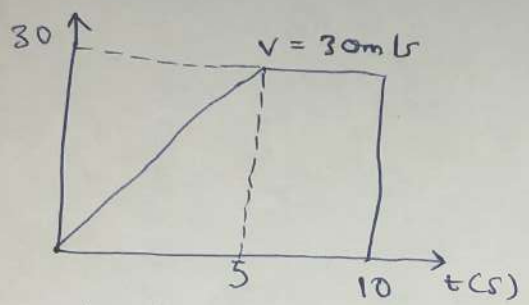
4) $S = 3t^2$

$V = 6t$

At $t = 5$

$V = 6 \times 5$

$V = 30 m/s$

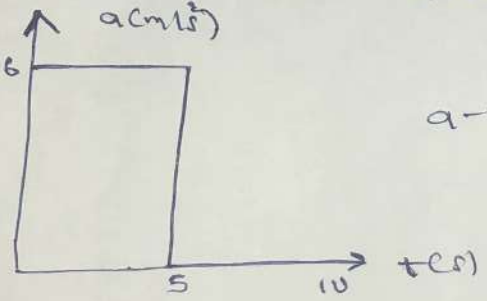


$V = (6t)\ m/s$

$a = 6 m/s^2$

$V = 30 m/s$

$a = 0 m/s^2$



a-t graph

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

$\int dv = \int a \cdot dt$

$\int_0^v dv = \int_0^t 20 \cdot dt$

$v = 20t$

At $t = 5s$

$V = 100 m/s$

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

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

$V - 100 = -10t + 50$

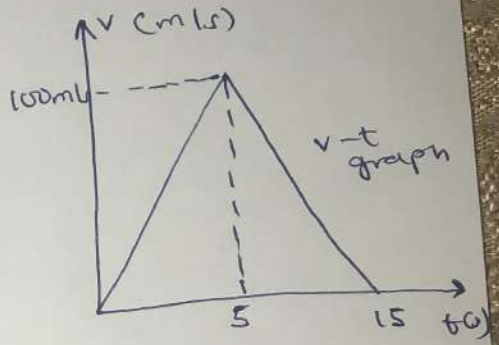
$V = (-10t + 150) m/s$

At $V = 0$

$0 = -10t + 150$

$-150 = -10t$

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



6) $v = 30t$

$\int ds = \int v dt$

$\int_0^S ds = \int_0^t (30t)\, dt$

$S = 15t^2$

At $t = 5s$

$S = 15(5)^2$

$S = 375 m$

$5s \le t \le 15s$

$v = -15t + 225$

$\int_{375}^{s} ds = \int_5^{15} (-15t + 225)\, dt$

$s - 375 = \frac{-15t^2}{2} + 225t \Big|_5^{15}$

$$S - 375 = \left[\frac{-15(15^2)}{2} + 225(15)\right] - \left[\frac{15(5)^2}{2} + 225(5)\right]$$

$$S - 375 = \left[\frac{-15 \times 225}{2} + 3375\right] - \left[\frac{-15 \times 25}{2} + 1125\right]$$

$$S - 375 = (-1687.5 + 3375) - (-187.5 + 1125)$$

$$S - 375 = +1687.5 - 937.5$$

$$S - 375 = 750$$

$$S = 1125\text{m}$$

S-t graph