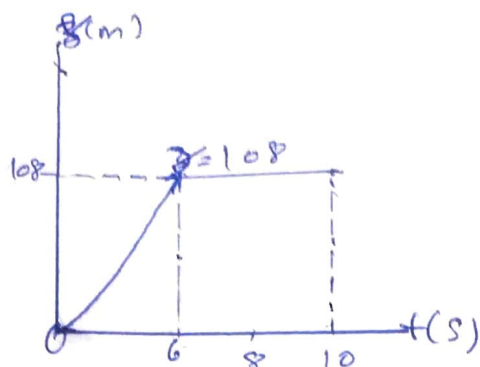


Mechanics

1)



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

at $t = 6s$

$$v = 1.5 \times 6^2$$

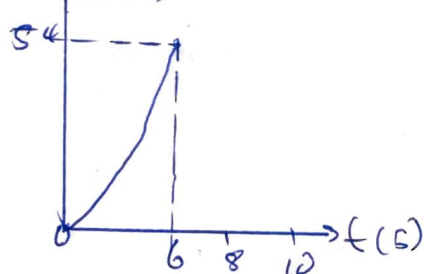
$$= 1.5 \times 36$$

$$v = 54 \text{ m/s}$$

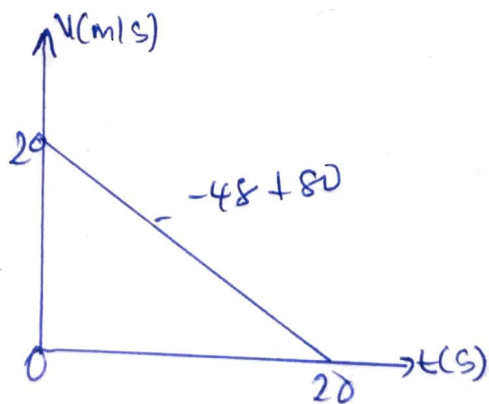
at $t = 6s - 10s, s = 108$

$$\therefore v = 0$$

v-t graph



2)



1) $s = \int v dt$

$$s = \int (-4t + 80)$$

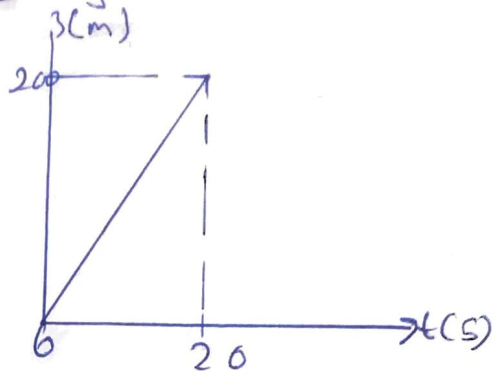
$$s = -2t^2 + 80t$$

at $t = 20s$

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

$$s = 1600 - 800 = 800 \text{ m}$$

s-t graph.



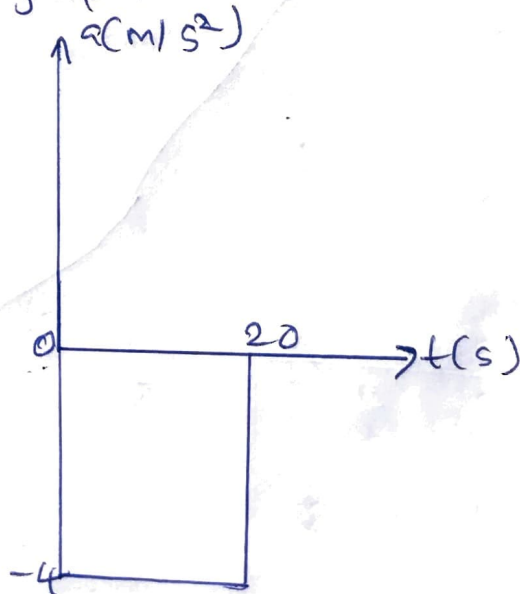
ii) acceleration

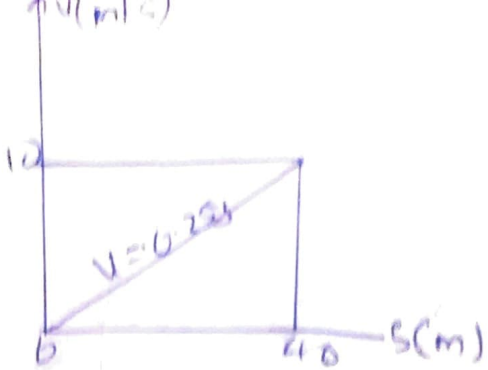
$$a = \frac{dv}{dt}$$

$$\therefore a = -4 \text{ m/s}^2$$

at $t = 20s, a = -4 \text{ m/s}^2$

a-t graph.





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

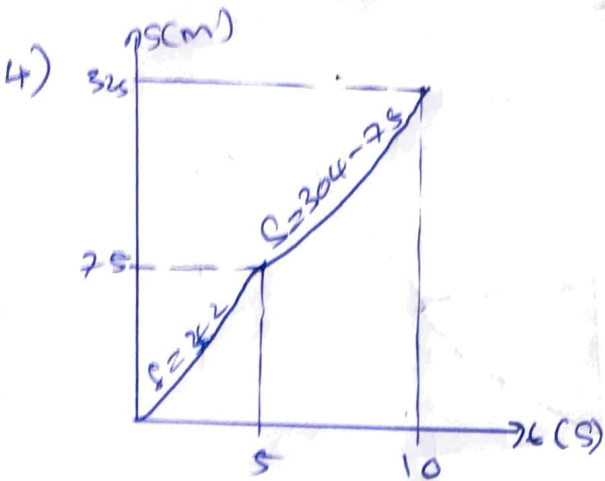
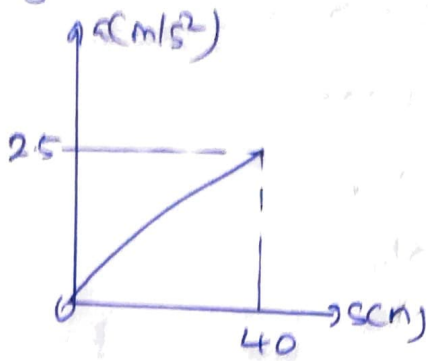
$$v = 0.25t$$

$$a = 10 \times d(0.25t)/ds$$

$$a = 10 \times 0.25$$

$$a = 2.5 \text{ m/s}^2$$

a-s graph



1) $v = ds/dt$

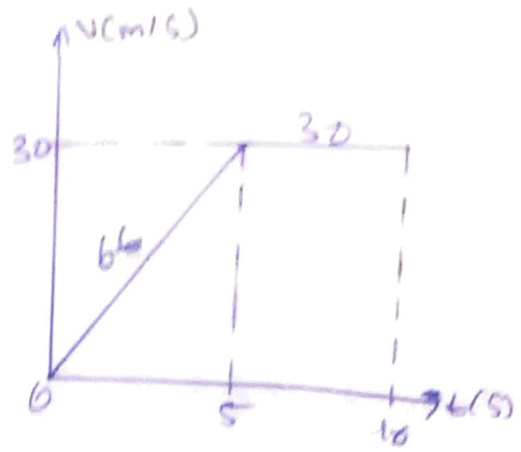
at $t = 5s$

$$v = 66 = 6 \times 5 = 30 \text{ m/s}$$

at $t = 10s$

$$v = 30 \text{ m/s}$$

v-t graph



ii) $a = dv/dt$

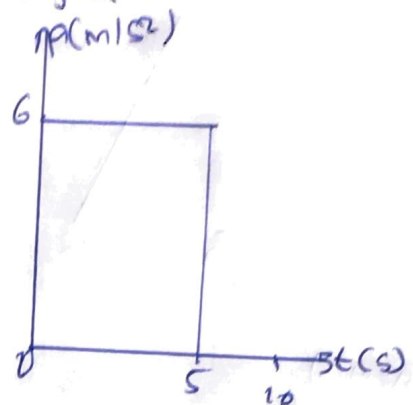
at $t = 5s$

$$a = 6 \text{ m/s}^2$$

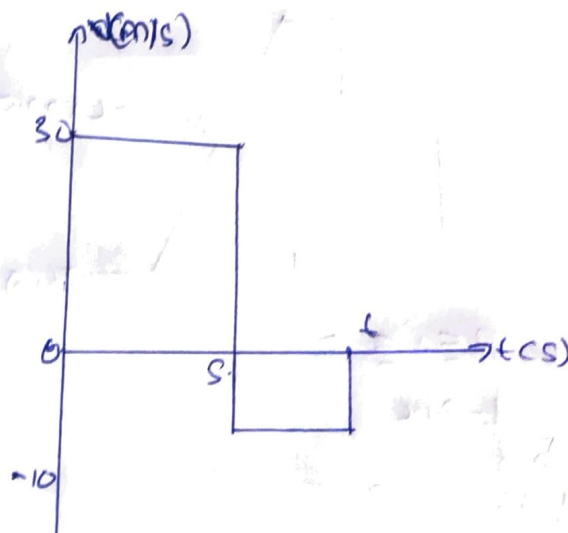
at $t = 10s$

$$a = 0 \text{ m/s}^2$$

a-t graph



5)



i) $v = \int a dt$

$$v = \int 20 dt$$

$$v = 20t$$

at $t = 5s$

$$v = 20 \times 5 = 100 \text{ m/s}$$

$$s < t \leq t'$$

$$\int_0^u \downarrow v = \int_5^{t'} -10 dt$$

$$u - 100 = -10t' + 10(5)$$

$$u - 100 = -10t' + 50$$

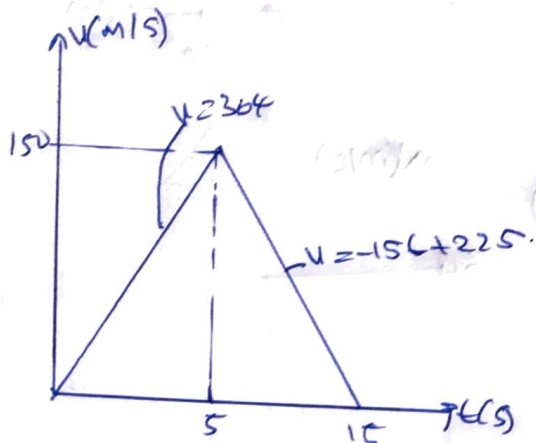
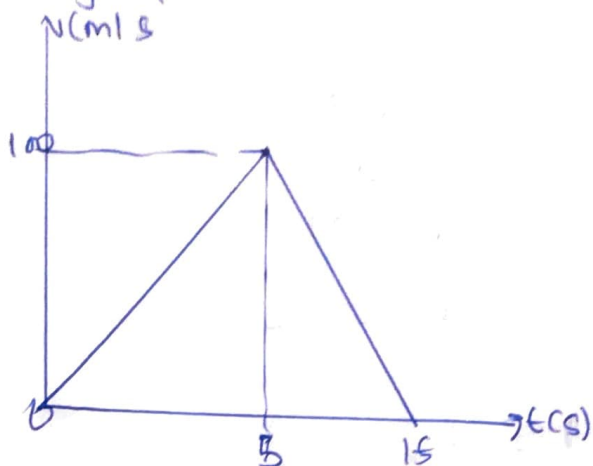
$$u - t = u = 0$$

$$0 - 100 = -10t' + 50$$

$$10t' = 150$$

$$t' = 15$$

v-t graph.



$$0 \leq t \leq 5$$

$$v = 30t$$

$$\int_0^5 ds = \int_0^5 30t dt$$

$$s = 15t^2 \Big|_0^5$$

$$s = 15(5)^2 - 15(0)^2$$

$$s = 15 \times 25$$

$$s = 375 \text{ m}$$

$$s < t \leq 15$$

$$u = -15t + 225$$

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

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

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

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

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

$$s - 375 = +1687.5 - 937.5$$

$$s - 375 = 750$$

$$s = 750 + 375$$

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

s-t graph.

