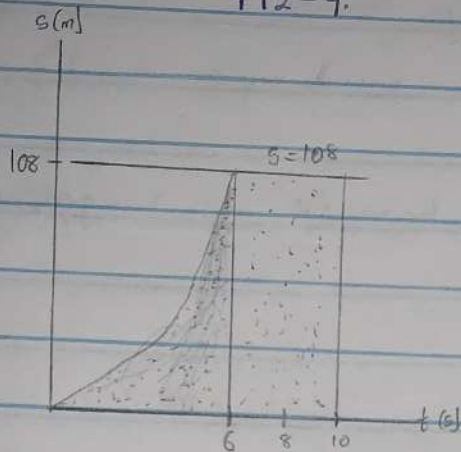


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F12-9.



$$v = \frac{ds}{dt}$$

$$v = 1.5t^2$$

$$\text{at } t = 6s$$

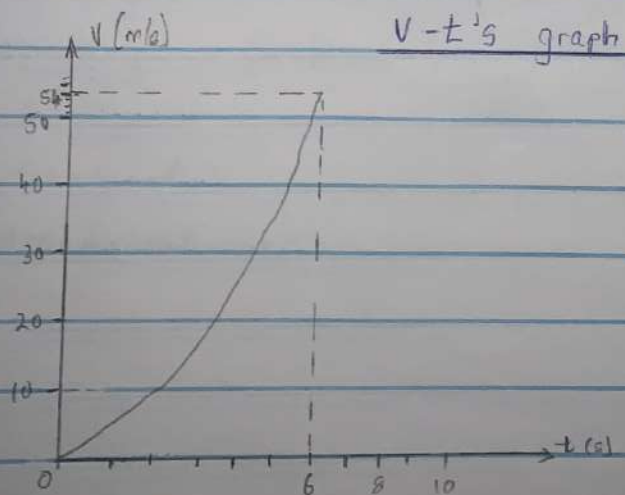
$$v = 1.5 \times 6^2$$

$$= 1.5 \times 36$$

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

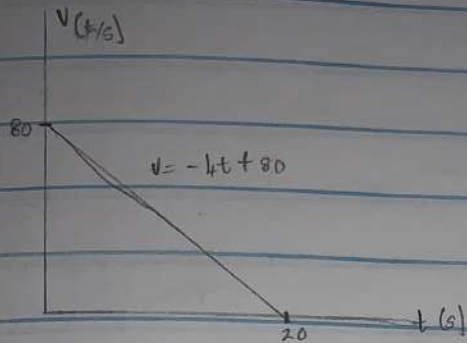
$$t = 6s - 10s \quad s = 108$$

$$\therefore v = 0$$



F12-10

2



i

$$s = \int v dt$$

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

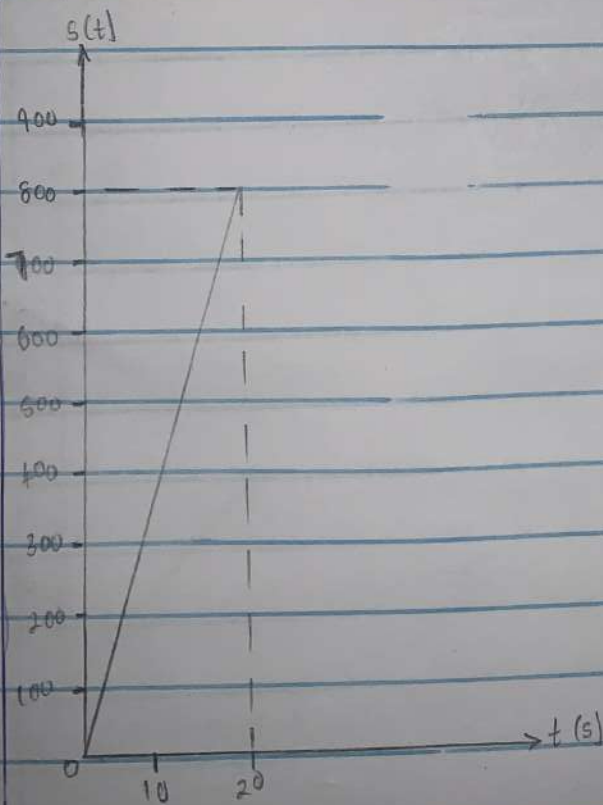
$$s = -2t^2 + 80t$$

at  $t = 20s$

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

$$s = 800m$$

s-t graph



ii) acceleration

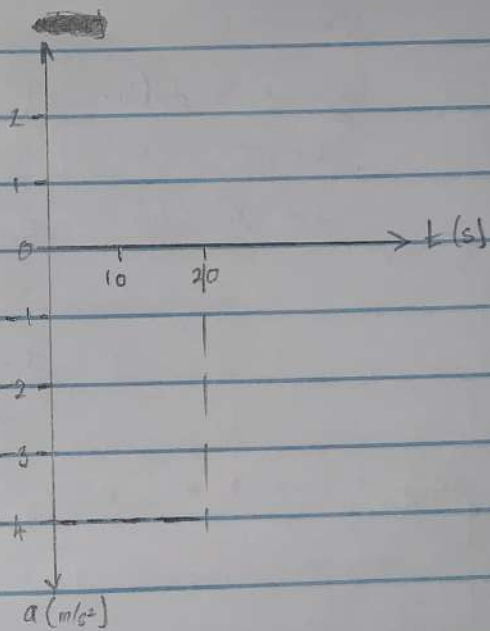
$$a = \frac{dv}{dt}$$

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

at  $t = 20s$

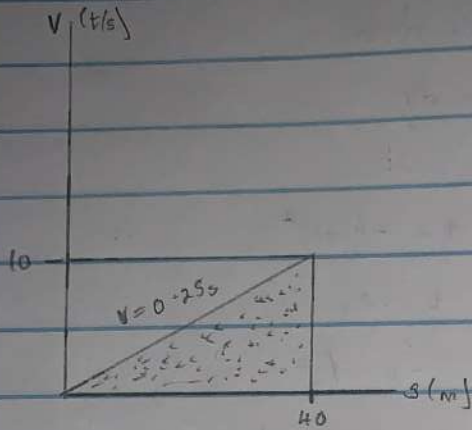
$$a = -4 \text{ m/s}^2$$

a-t graph



F12-11

3



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

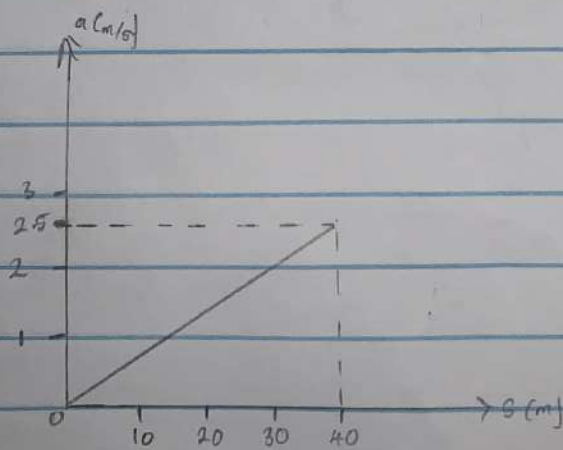
$$v = 0.25s$$

$$a = 10 \times d(0.25s)$$

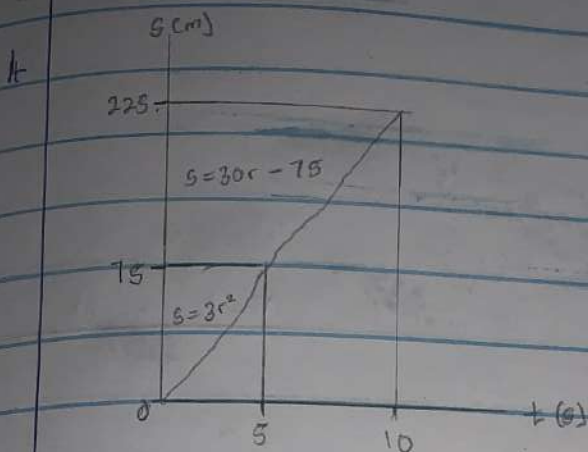
$$a = 10 \times 0.25$$

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

a-s graph



F12-12



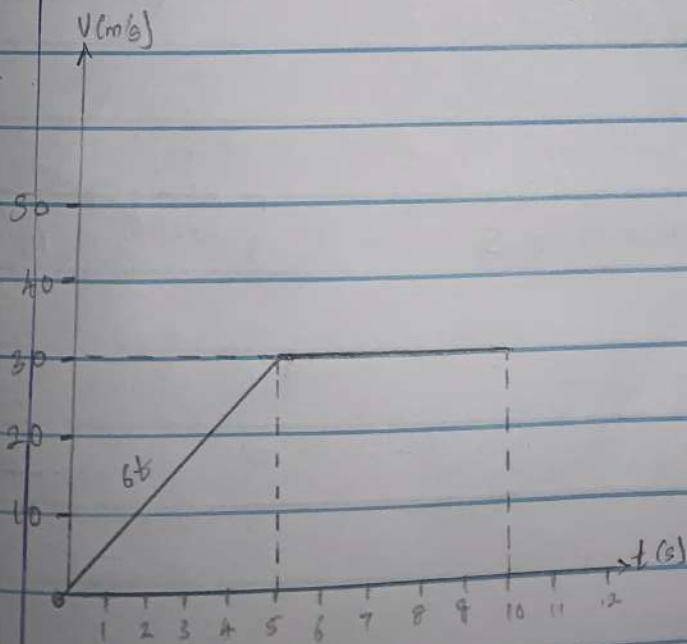
i)  $v = \frac{ds}{dt}$   
at  $t = 5s$

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

at  $t = 10s$

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

v-t graph



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

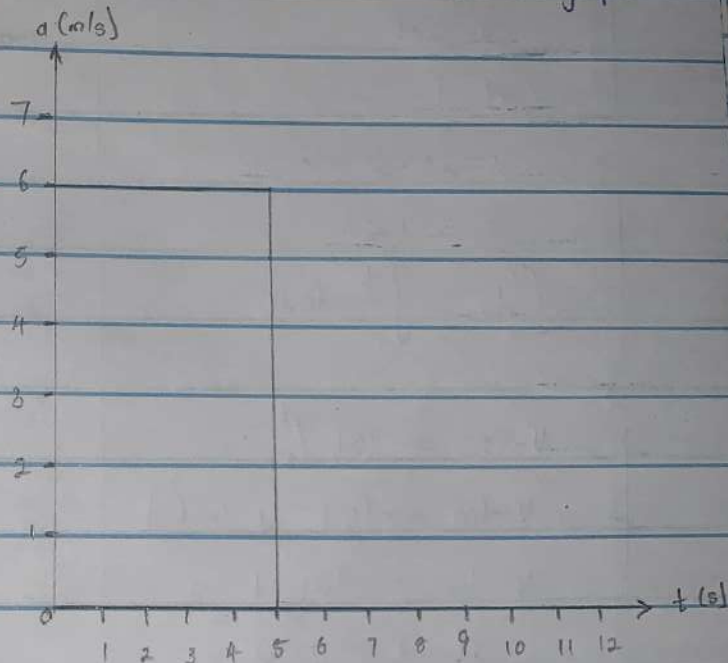
at  $t = 5$

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

at  $t = 10s$

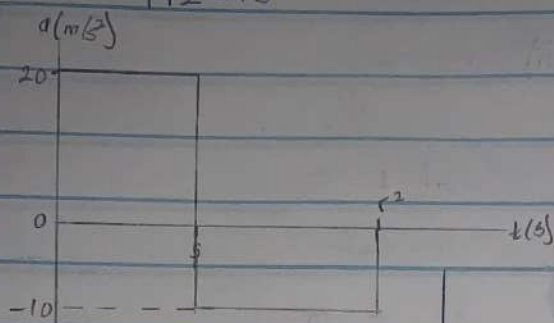
$$a = 0 \text{ m/s}^2$$

a-t graph



F12-13

5



$$i) \quad v = \int a dt$$

$$v = \int 20 dt$$

$$v = 20t$$

$$\text{at } t = 5s$$

$$v = 20 \times 5 = 100 m/s$$

$$5s < t \leq t'$$

$$\int_{100}^v dv = \int_5^{t'} -10 dt$$

$$v - 100 = -10t \Big|_5^{t'}$$

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

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

$$\text{at } t', v = 0$$

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

$$10t' = 150$$

$$t' = 15s$$

V-t graph

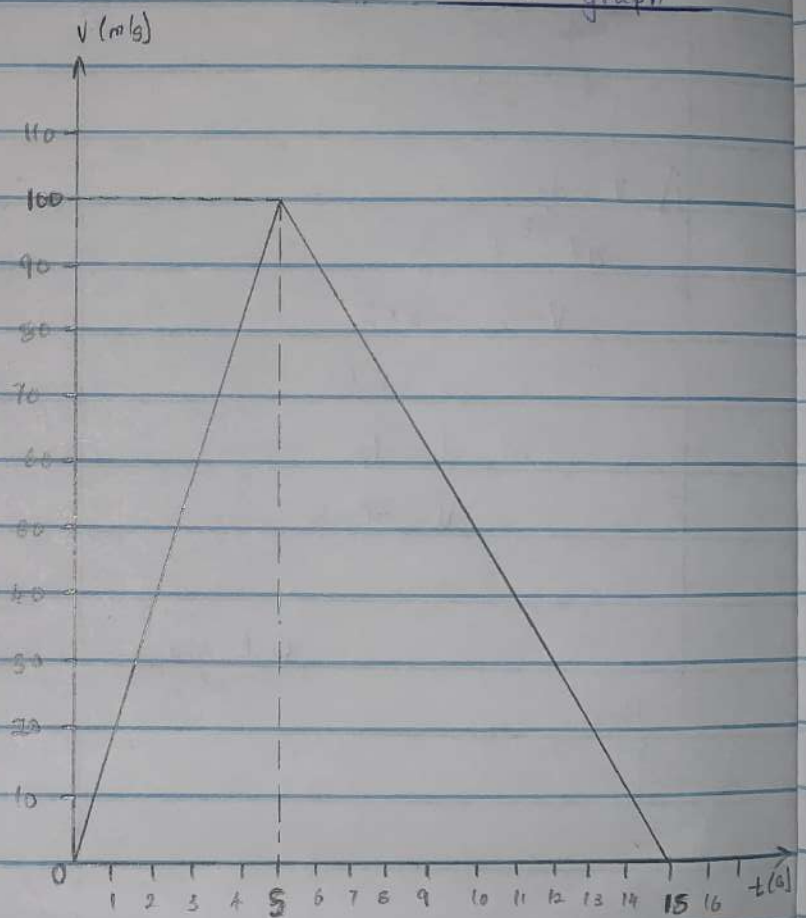
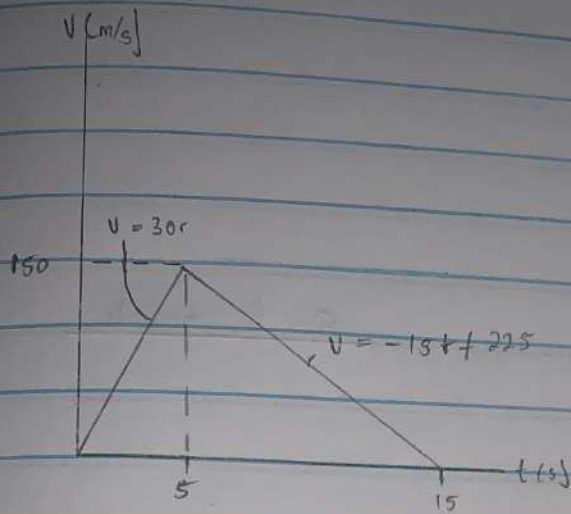


Fig-14

6



$$0 \leq t \leq 5_s$$

$$v = 30t$$

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

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

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

$$s = 15 \times 25$$

$$s = 375_m$$

$$5_s \leq t \leq 15_s$$

$$v = -15t + 225$$

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

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

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

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

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

$$s - 375 = 1687.5 - 937.5$$

$$s - 375 = 750$$

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

s-t graph

