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Department:- Petroleum Engineering

Course Code:- ENG 234 (Mechanics)

1) first section

$$s = 0.5t^3, \quad v = \frac{ds}{dt}; \quad v = \frac{3}{2}t^2$$

$$\text{@ } t=0 \quad \text{@ } t=4 \quad \text{@ } t=5.9$$

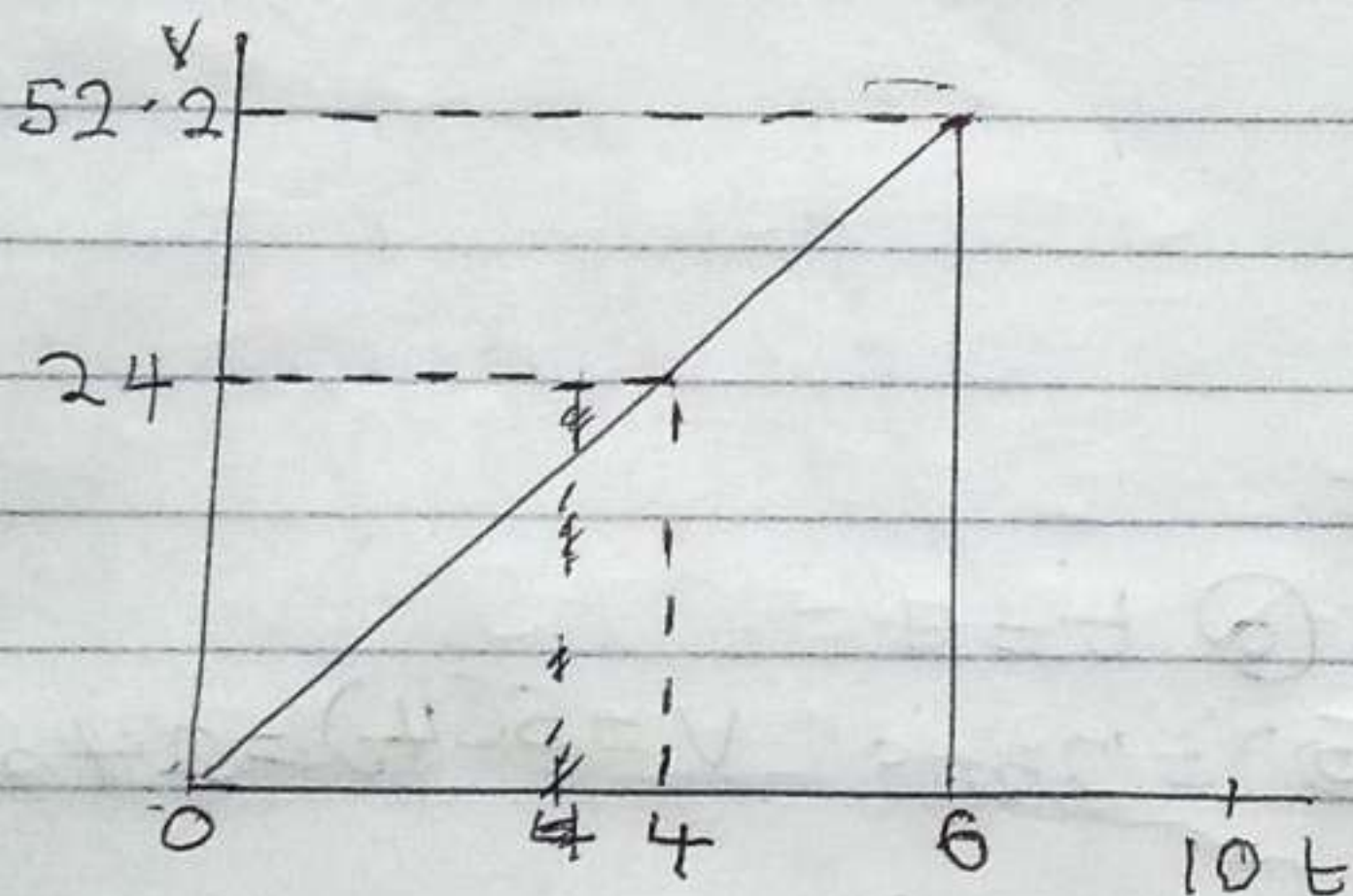
$$v = \frac{3}{2}(0)^2 \quad v = \frac{3}{2}(4)^2 \quad v = \frac{3}{2}(5.9)^2$$

$$v = 0 \text{ m/s} \quad v = 24 \text{ m/s} \quad v = 52.2 \text{ m/s}$$

2nd Section

$$s = 108 \text{ m}; \quad v = \frac{ds}{dt}; \quad v = 0 \text{ m/s}$$

Sketch



2) $v = -4t + 80$

$$s = \int -4t + 80 \Rightarrow -\frac{4t^2}{2} + 80t$$

$$\text{@ } t=0 \quad \text{@ } t=10$$

$$s=0 \quad s = \frac{4(10^2)}{2} + 80(10)$$

$$s = -200 + 800$$

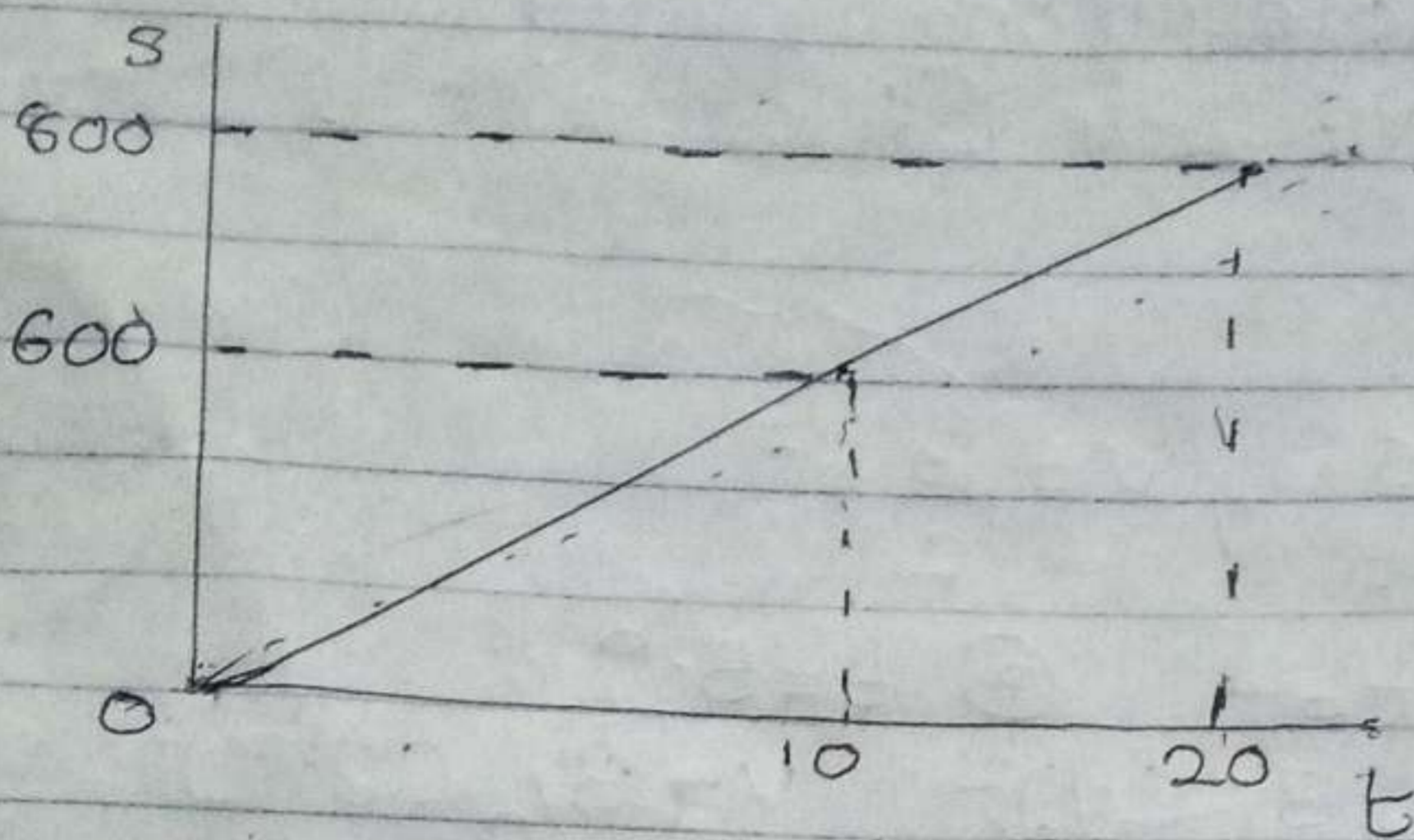
$$s = 600 \text{ m}$$

$$\text{@ } t=20$$

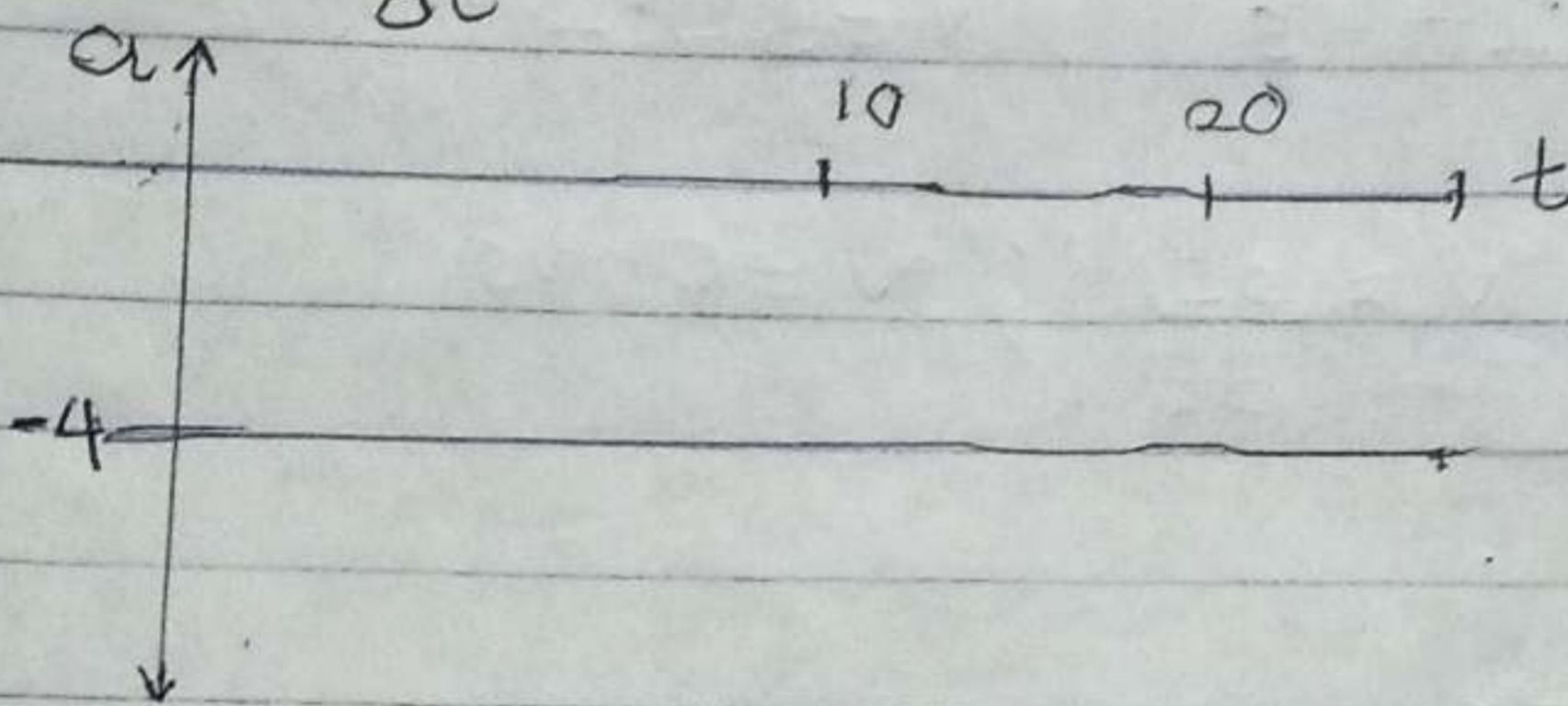
$$s = -\frac{4(20)^2}{2} + 80(20); \quad s = -800 + 1600$$

$$s = 800 \text{ m} //$$

Sketch



$$a = \frac{dv}{dt} \Rightarrow -4 \text{ m/s}^2$$



4)

First section

$$s = 3t^2 \quad v = 6t$$

@ $t=0$ @ $t=2$ @ $t=4$

$$v = 0 \text{ m/s} \quad v = 6(2) = 12 \text{ m/s} \quad v = 6(4) = 24 \text{ m/s}$$

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

2nd section

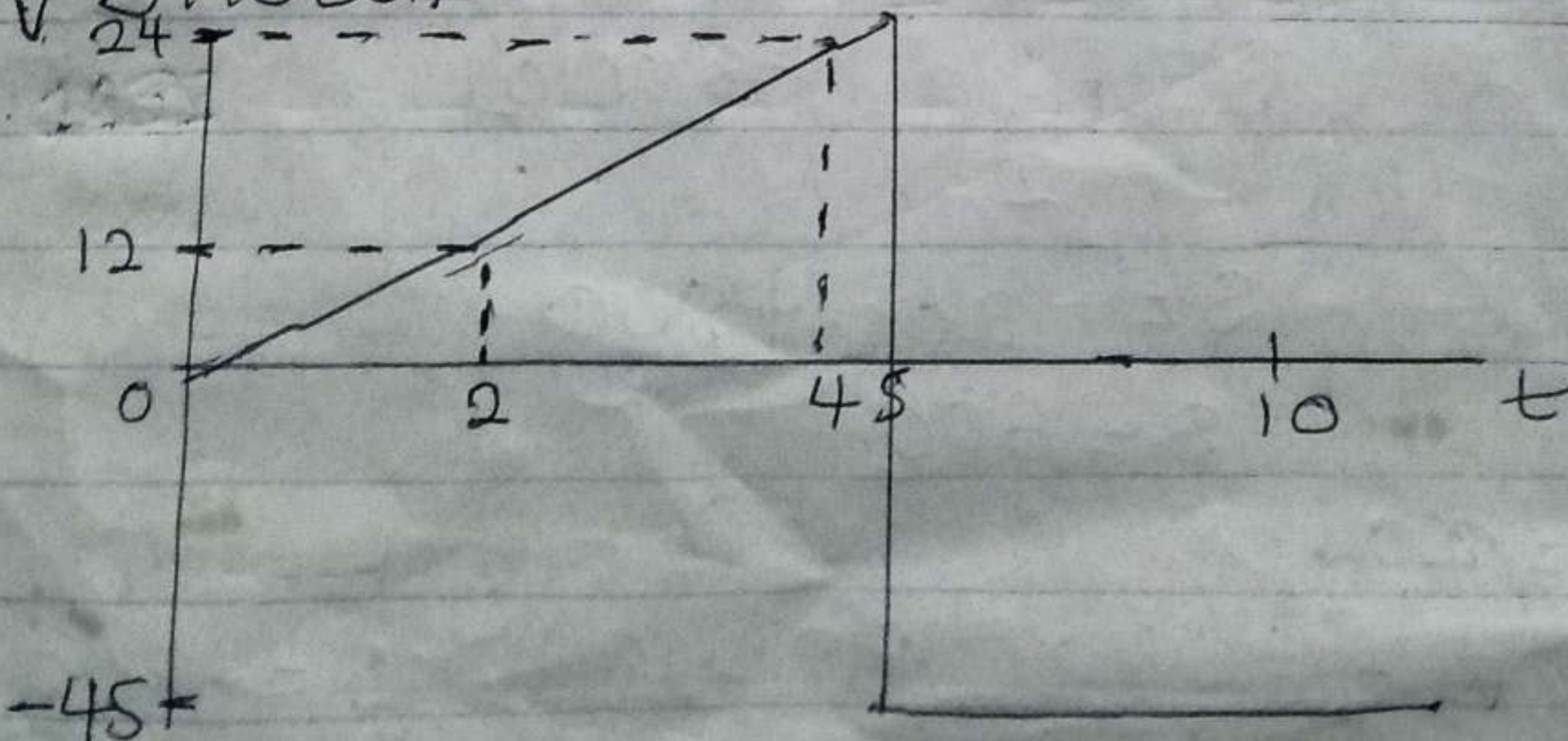
$$s = 30t - 75$$

$$v = 30 - 75$$

$$v = -45 \text{ m/s}$$

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

Sketch



first section

$$a = 20 \text{ m/s}^2$$

$$v = \int 20 ; 20t + c$$

The vehicle starts from rest @ $t = 0$

$$\therefore v = 0 ; 0 = 20(0) + c$$

$$\therefore c = 0,$$

$$v = 20t$$

@ $t = 2$ @ $t = 4$

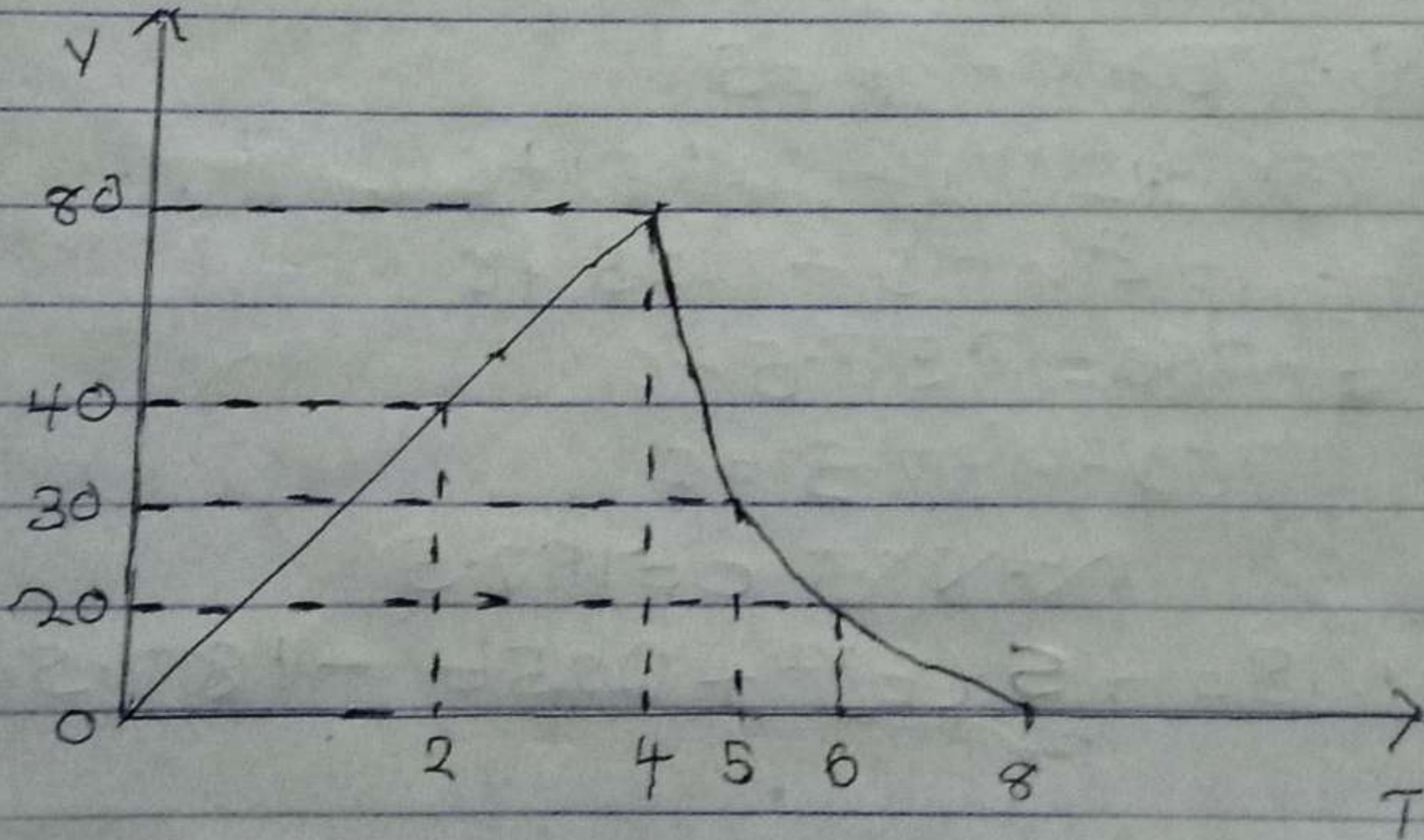
$$v = 20(2) \quad v = 20(4)$$

$$= 40 \text{ m/s} \quad v = 80 \text{ m/s}$$

2nd section

$$a = -10 \text{ m/s}^2$$

$$v = -10t + c$$



6) First section

$$v = 30t, \quad s = \int 30t \, dt \Rightarrow 30 \frac{t^2}{2} + C$$

$$\text{① } t=0; s=0; 0 = \frac{30}{2}(0)^2 + C \quad \therefore C=0$$

$$s = 30 \frac{t^2}{2}$$

$$= \text{② } t=2 \quad \text{③ } t=4$$

$$s = \frac{30}{2}(2)^2 \quad s = \frac{30}{2}(4)^2$$

$$s = 60 \text{m} \quad s = 240 \text{m}$$

2nd Section

$$v = -15t + 225$$

$$s = \frac{-15}{2}t^2 + 225t + C$$

$$s = 750 \text{m at } t = 5$$

$$\therefore 750 = \frac{-15}{2}(5)^2 + 225(5) + C$$

$$\Rightarrow 750 = -\frac{1}{2} \cdot 18 \cdot 7.5 + 1,125 + C$$

$$\Rightarrow 750 = 937.5 + C$$

$$750 - 937.5 = C$$

$$\Rightarrow -187.5 = C$$

$$\therefore s = \frac{-15}{2}(t)^2 + 225t - 187.5$$

$$\text{④ } t=8$$

$$s = \frac{-15(8)^2}{2} + 225(8) - 187.5$$

$$s = 1,132.5 \text{m}$$

$$\text{⑤ } t=15$$

$$\Rightarrow s = 1500 \text{m}$$

