

AIKU JOSHUA ADEBIMYI

ELECTRICAL / ELECTRONICS ENGINEERING

181EN6041007

Engineering Mechanics

1) Given that

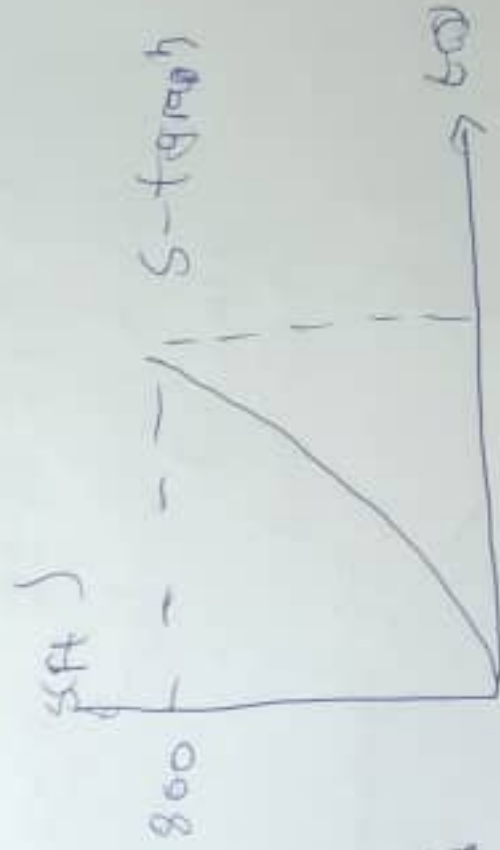
$$S = 0.5t^3 \text{ m}$$

$$V \text{ (ft/s)} = 15t^2$$

60 at $t = 6$

$$V = 15(6)^2 = 54 \text{ m/s}$$

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



2) Given that

$$V = -4t + 80$$

$$S = \int V dt$$

$$S = \int_0^{20} (-4t + 80) dt$$

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

$$\therefore \text{at } t = 20$$

$$S = \left[-2(20)^2 + 80(20) \right]$$

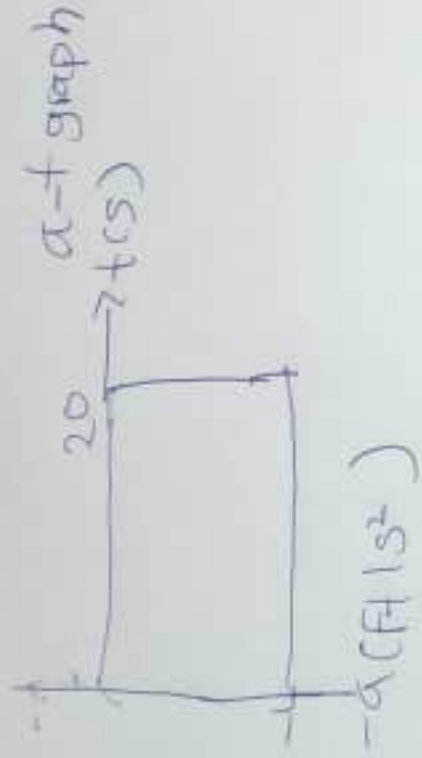
$$S = -800 + 1600$$

$$S = 800 \text{ ft}$$

$$v = (-4t + 80) \text{ ft/s}$$

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

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



$$3) v = (0.25s) \text{ m/s}$$

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

$$a = 0.25s \quad (0.25)$$

$$a = (0.0625) \text{ m/s}^2$$

$$\text{At } s = 40 \text{ m}$$

$$a = (0.0625 \times 40)$$

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

$$a \text{ (m/s}^2)$$

$$\sqrt{a \text{ (m/s}^2)}$$

$$2.5 \text{ --- } a = 0.0625s$$

a-s graph



4.) $S = 3t^2$

$V = 6t$

At $t = 5$

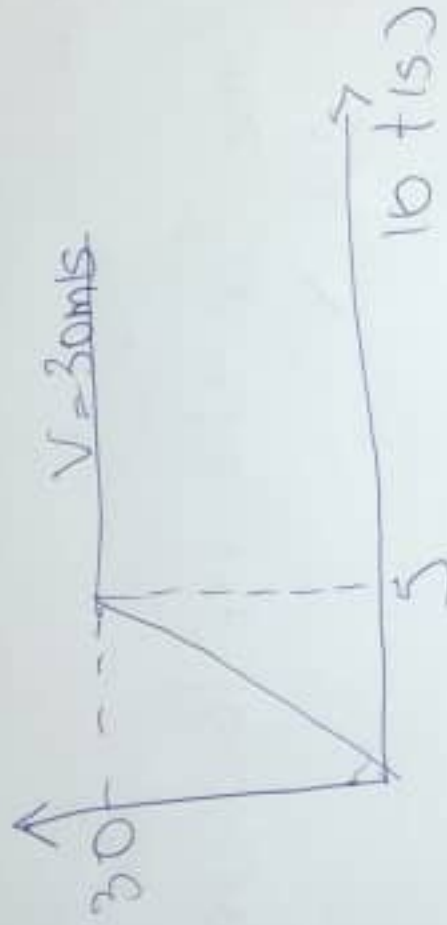
$V = 6 \times 5$

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

$S = 30t - 7t^2$

$V = 30 - 14t$

V-t graph



$V = (6t) \text{ m/s}$

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

 $a \rightarrow (\text{m/s}^2)$

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

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

 $a \rightarrow \text{graph}$ 

5.) $a = 20 \text{ m/s}^2$ $a = -10 \text{ m/s}^2$

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

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

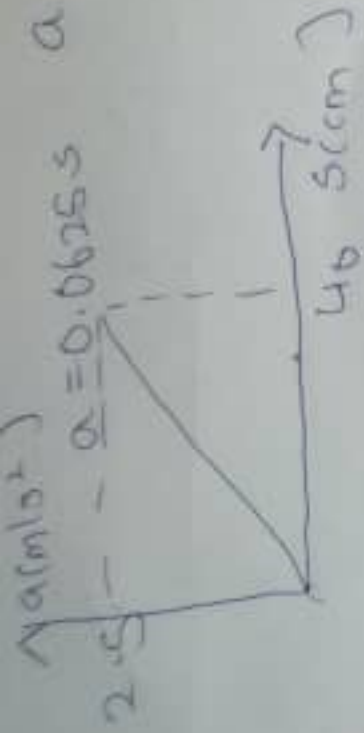
$V = 20t$

At $t = 5s$

$V = 100 \text{ m/s}$

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

a - s graph



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

$$V - 100 = -10t + 50$$

$$V = (-10t + 150) \text{ m/s}$$

$$\text{At } v = 0$$

$$0 = -10t + 150$$

$$-150 = -10t$$

$t = 15 \text{ sec}$ (time for the car to come to rest)



$$b) v = 30t$$

$$\int ds = \int v dt$$

$$\int_0^3 ds = \int_0^t (30t) dt$$

$$s = 15t^2$$

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

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

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

$$v = -15t + 225$$

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

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

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

$$\text{At } = 15s$$

$$s = \frac{15(15)^2 + 225(15) + 5625}{2}$$

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

