

Image

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ENGINEERING MECHANICS (ENG 234)

1) Given that

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

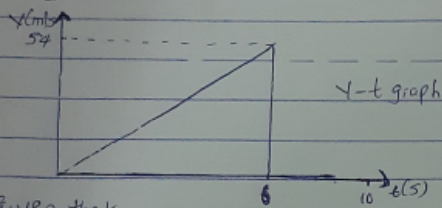
$$v = \frac{ds}{dt}, v = 1.5t^2$$

SO at $t = 6$

$$v = 1.5(6)^2 = 54 \text{ m/s}$$

$$s = 108 \text{ m}$$

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



2) Given that

$$v = -4t + 80$$

$$s = \int v dt$$

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

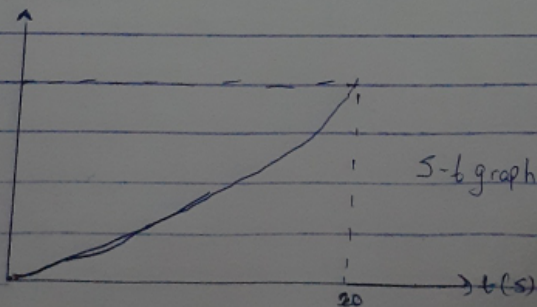
$$s = [-2t^2 + 80t] \Big|_0^{20}$$

\therefore at $t = 20$

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

$$s = -800 + 1600$$

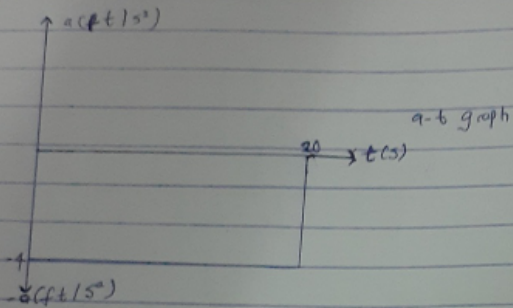
$$s = 800 \text{ m}$$



$$v = (-at + 30) \text{ ft/s}$$

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

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



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

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

$$a = 0.25s(0.25)$$

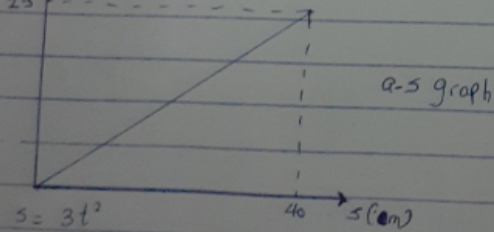
$$a = (0.0625s) \text{ m/s}^2$$

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

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

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

$$a = 2.5 \text{ m/s}^2 \quad a = 0.0625s$$



$$4) s = 3t^2$$

$$v = 6t$$

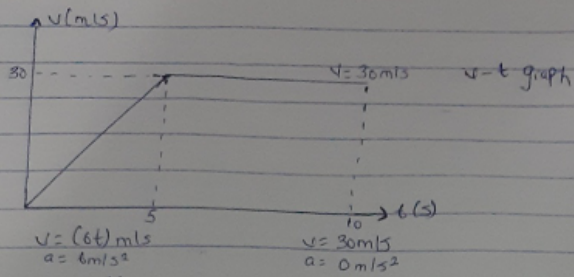
$$\text{At } t = 5$$

$$v = 6 \times 5$$

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

$$s = 3 \times 6 \times 5$$

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

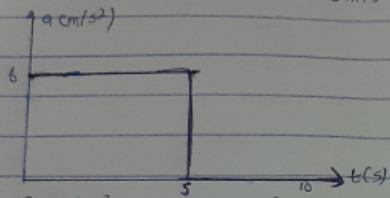


$$v = (6t) \text{ m/s}$$

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

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

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



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

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

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

$$v = 20t$$

At $t = 5s$,

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

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

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

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

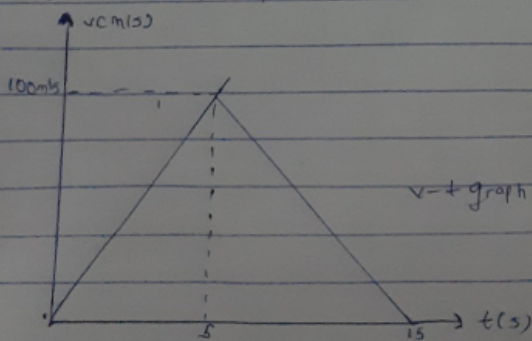
$$v = (-10t + 150) \text{ m/s}$$

At $v = 0$

$$0 = -10t + 150$$

$$-150 = -10t$$

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



$$b) v = 30t$$

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

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

$$s = 15t^2$$

$$At \cdot t = 55$$

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

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