

ATOGHIE VICTORIA ALOIYE.

18/ENG08/003.

BIO-MECHANICAL ENGINEERING.

ENG 234.

1. $(0 \leq t \leq 6)$ secs:

$$s = 0.5t^3$$

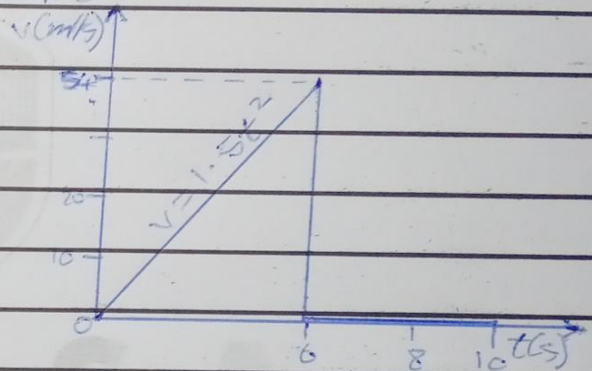
$$v = \frac{ds}{dt} = 1.5t^2$$

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

$(6 \leq t \leq 10)$ secs:

$$s = 108$$

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



2. $v = -4t + 80$

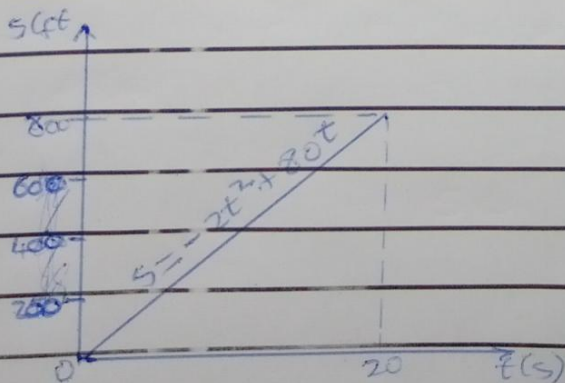
$$v = \frac{ds}{dt} \quad ds = v dt$$

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

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

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

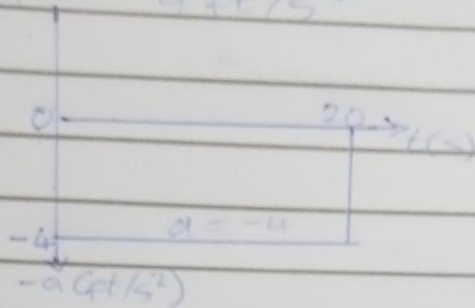
$$s = 800 \text{ ft}$$



Acceleration:

$$a = \frac{dv}{dt} = \frac{d(-4t + 80)}{dt}$$

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



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

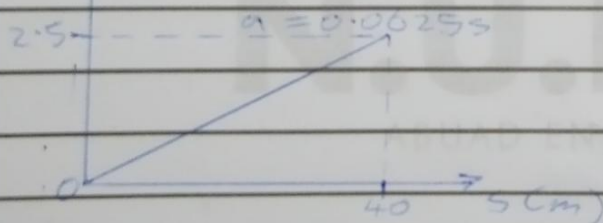
$$a = v \left(\frac{dv}{ds} \right) = 0.25s (0.25)$$

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

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

$$a = 0.0625 \times 40 = 2.5 \text{ m/s}^2$$

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



4: $(0 \leq t \leq 5) \text{ secs}$:

$$s = 3t^2$$

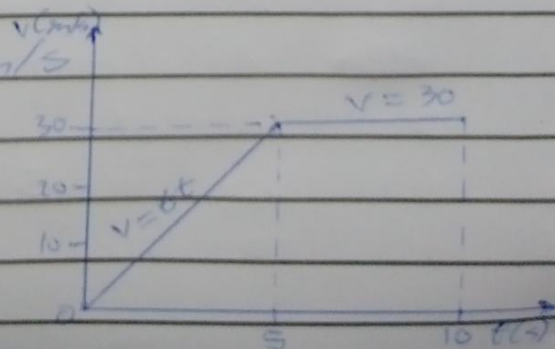
$$v = \frac{ds}{dt} = 6t$$

$$\text{Max } v = 6(5) = 30 \text{ m/s}$$

$(5 \leq t \leq 10) \text{ secs}$:

$$s = 30t - 75$$

$$v = \frac{ds}{dt} = 30 \text{ m/s}$$



Acceleration:

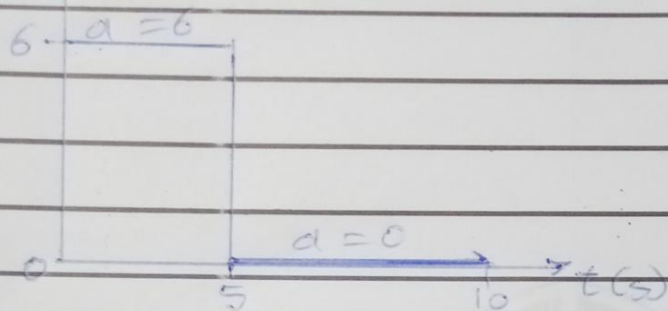
$(0 \leq t \leq 5)$ secs

$$v = 6t \quad a = \frac{dv}{dt} = 6 \text{ m/s}^2$$

$(5 \leq t \leq 10)$ secs

$$v = 30 \quad a = \frac{dv}{dt} = 0 \text{ m/s}^2$$

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



5 $0 \leq t \leq t'$

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

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

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

$$\int_{100}^v dv = \int_0^t 20 \cdot dt$$

$$v = 20t$$

At $t = 5$ s:

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

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

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

$$\text{At } v = 0 \quad v - 100 = -10t + 50$$

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

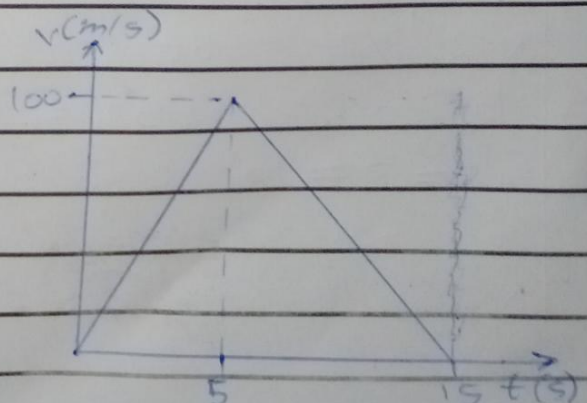
$$v = (150 - 10t) \text{ m/s}$$

~~At~~ At $v = 0$

$$0 = 150 - 10t$$

$$t = \frac{150}{10} = 15 \text{ s}$$

10



6. ($0 \leq t \leq 5$):

$$v = 30t \quad v = \frac{ds}{dt} \quad ds = v \cdot dt$$

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

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

$$s = 15(5)^2 = 375 \text{ m}$$

($5 \leq t \leq 15$):

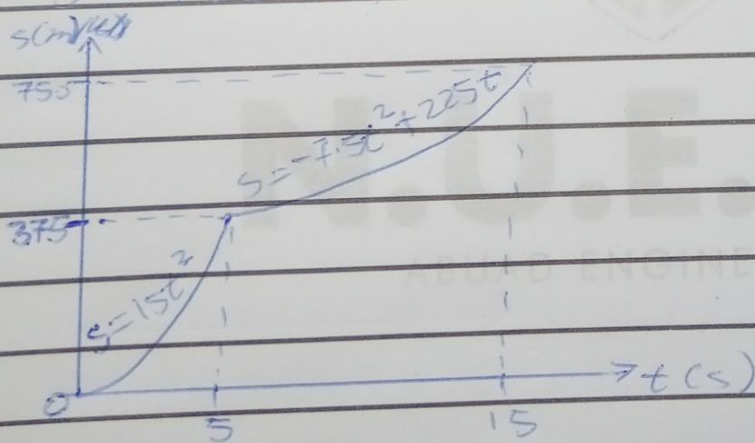
$$v = -15t + 225$$

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

$$s = -7.5t^2 + 225t \Big|_5^{15}$$

$$s = [-7.5(15)^2 + 225(15)] - [-7.5(5)^2 + 225(5)]$$

$$s = 1687.5 - 937.5 = 750 \text{ m}$$



$$\begin{aligned} \text{Total distance} &= 750 \text{ m} + 375 \text{ m} \\ &= \underline{\underline{1125 \text{ m}}} \end{aligned}$$