ENG 234 ASSIGNMENT

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18/MHS01/272

BIOMEDICAL ENGINEERING

12-9 $S = 0.5t^3 = 0.5(6)^3 = 108$

$t_1 = 6$

$t_2 = 8$

$t_3 = 10$

$v_1 = \frac{\delta s}{\delta t}\Big|_{t=6} = 1.5t^2$

$= 1.5(6)^2$

$= 54 m/s$

$v_2 = \frac{ds}{dt}\Big|_{t=8} = 1.5t^2$

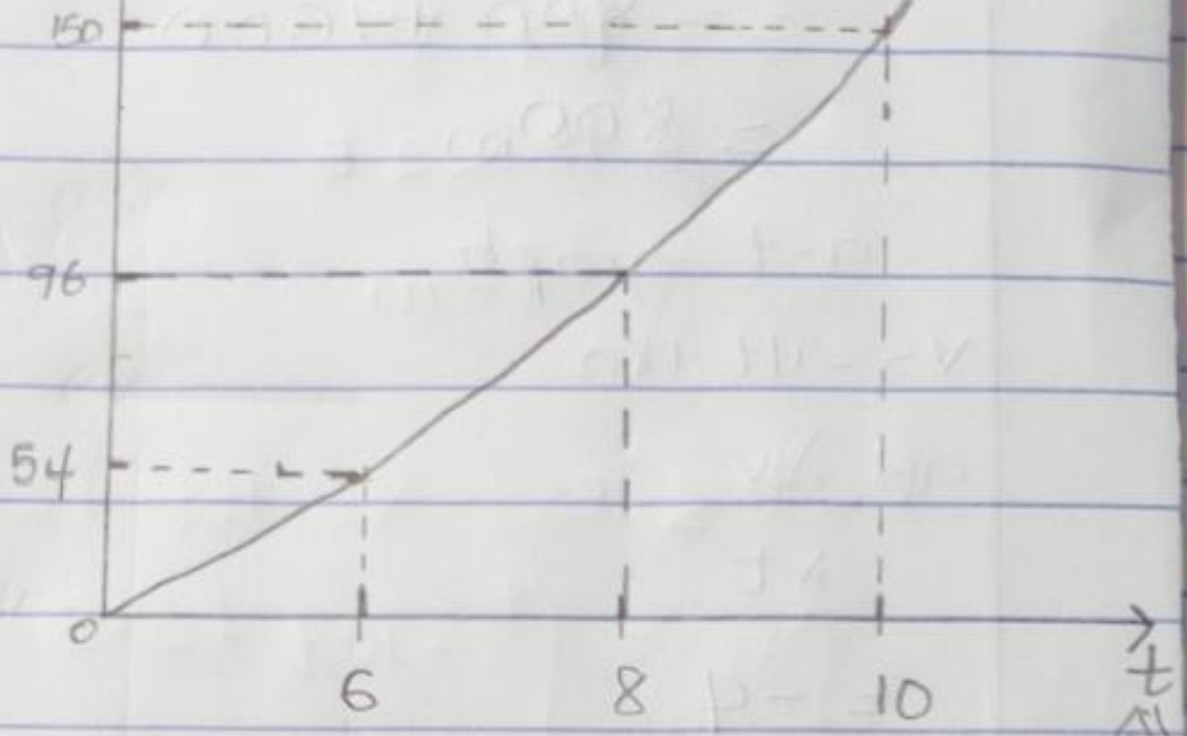
$= 1.5(8)^2$

$= 96 m/s$

$v_3 = \frac{ds}{dt}\Big|_{t=10} = 1.5(t)^2$

$= 1.5(10)^2$

$= 150 m/s$



v-t graph

12-10 $v = -4t + 80$ @

$t_1 = 0$; $t_2 = 20$

$v_1 = -4(0) + 80$

$v_1 = 80_{//}$

$v_2 = -4(20) + 80$

$v_2 = 0_{//}$

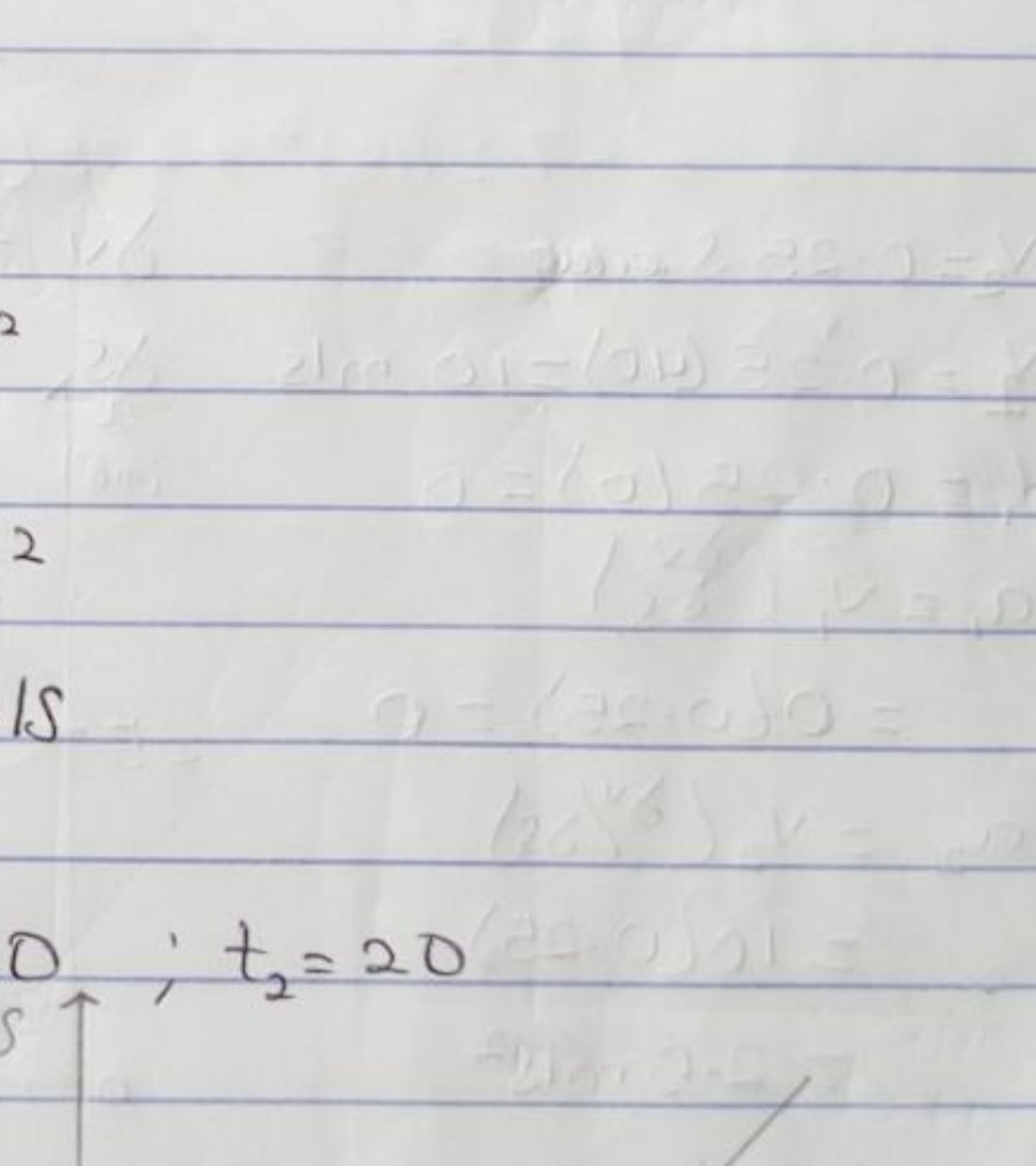
$S_1 = \int_0^{t_1} v\,dt$

$= -\frac{4t_1^2}{2} + 80t_1\Big|_0^{t_1}$

$= -2t_1^2 + 80t_1\Big|_0^{t_1}$

$= -2(0)^2 + 80(0)$

$= 0m$



S-t graph

$S_2 = \int v\,dt$

$= -2t^2 + 80t \Big|_0^{t_2}$

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

$= -800 + 1600$

$= 800m$

a-t graph

$v = -4t + 80$

$a = \frac{\delta v}{\delta t}$

$= -4$

12-11 $v_2 = 0.25\,s$ $\quad \frac{\delta v}{\delta s} = 0.25$

$v_2 = 0.25(40) = 10\ m/s$

$v_1 = 0.25(0) = 0$

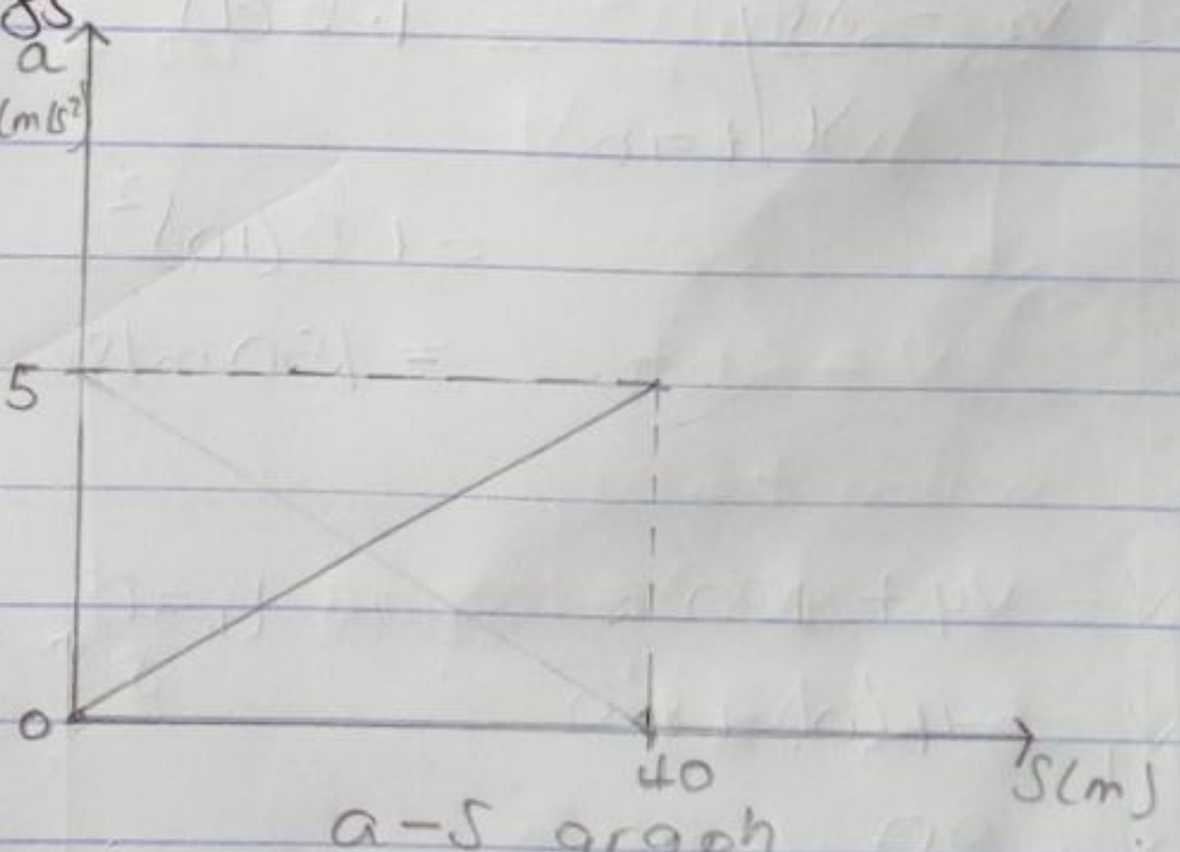
$a_1 = v_1\left(\frac{\delta v}{\delta s}\right)$

$= 0(0.25) = 0$

$a_2 = v_2(\delta v/\delta s)$

$= 10(0.25)$

$= 2.5\ m/s^2$



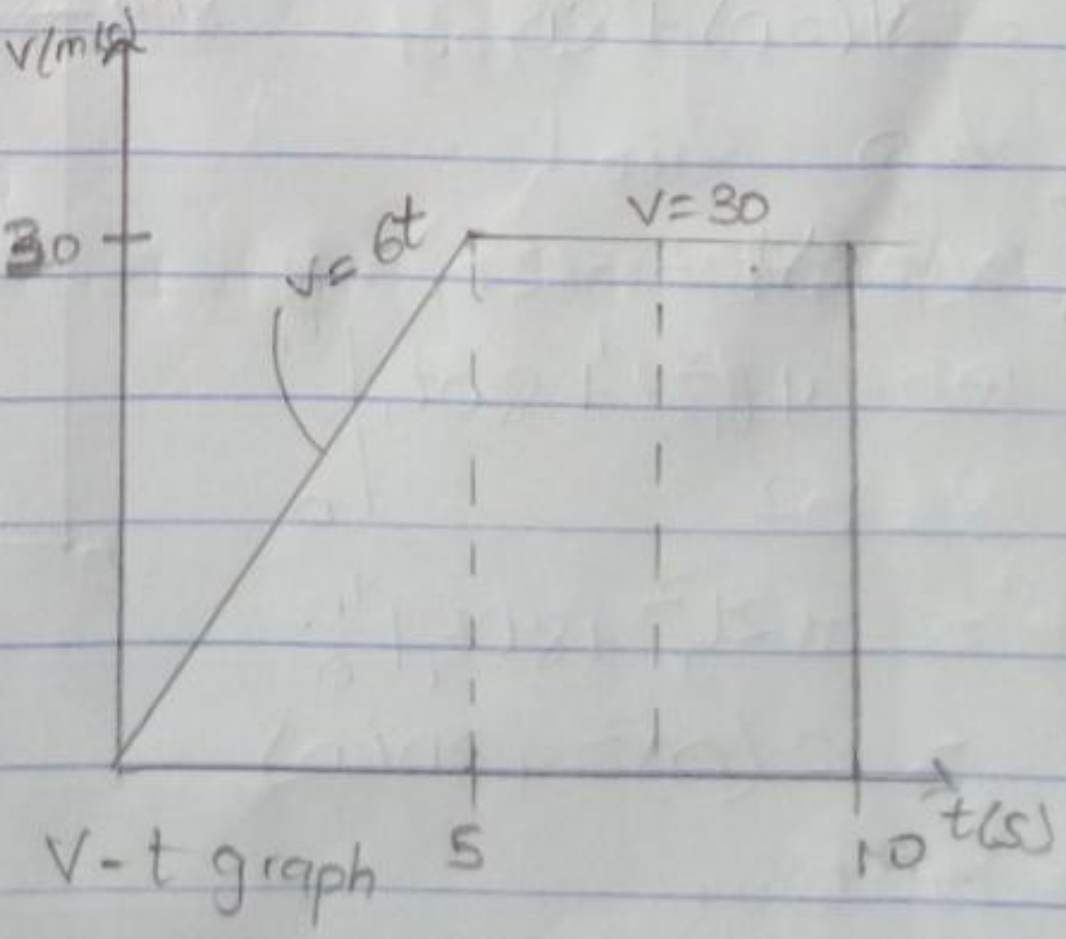
a-s graph

12-12 $0 \leq t \leq 5s$, $s = 3t^2$

$v = \frac{\delta s}{\delta t} = 6t$

$5 < t \leq 10$, $s = 30t - 75$

$v = \frac{\delta s}{\delta t} = 30\ m/s$



V-t graph

at $t = 7.5s$, using slope of s-t graph is determined

from the straight line from 5s to 10s

$$V = \frac{\Delta s}{\Delta t} = \frac{225 - 75}{10 - 5} = 30 \text{ m/s}$$

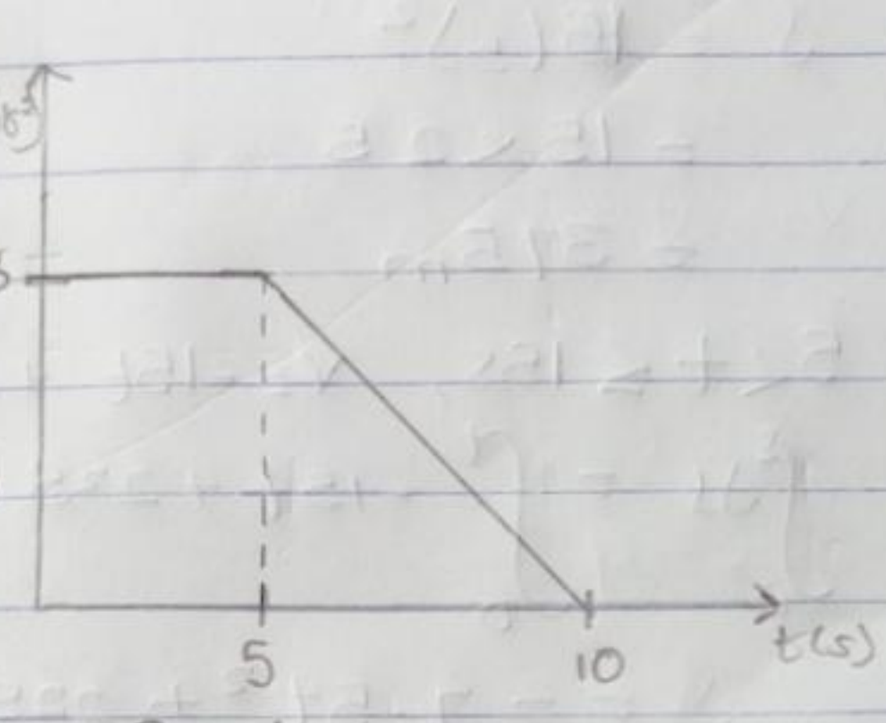
a-t graph

5. $0 \le t < 5s$, $v = 6t$ (m/s)

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

$5 < t \le 10s$ $\quad v = 20$ (m/s)

$$a = \frac{\delta v}{\delta t} = 0$$



a-t graph

12-13 $\delta v = a \delta t$

$0 \le t \le 5s$

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

$$\int_0^v \delta v = \int_0^t 20 \delta t$$

$v = 20t$

when $t = 5s$,

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

$5 < t \le t'$

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

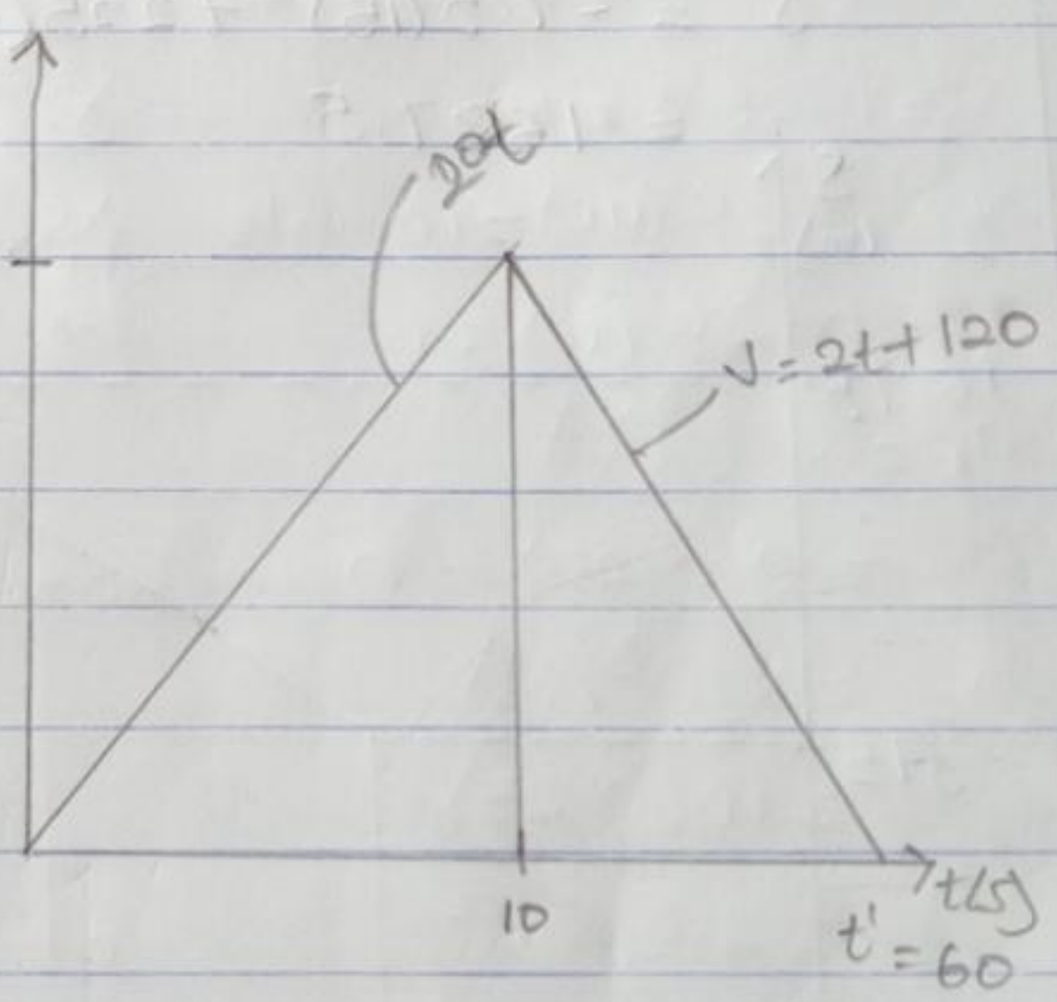
$$\int_{100}^{v} \delta v = \int_{100}^{t} -10 \delta t$$

$v = (-10t + 120) \text{ m/s}$

when $t = t'$

$v = 0$

$t' = 60s$



v-t graph

12-14 $S = \int v \delta t$

$0 \le t \le 5s$, $v = 30t$

$$\int_0^s ds = \int_0^t 30t\,dt$$

$s = 15t^2$

when $t = 5s$

$s = 15(5)^2$

$= 15 \times 25$

$= 375m$

$5 < t \leq 15s$, $v = -15t + 225$

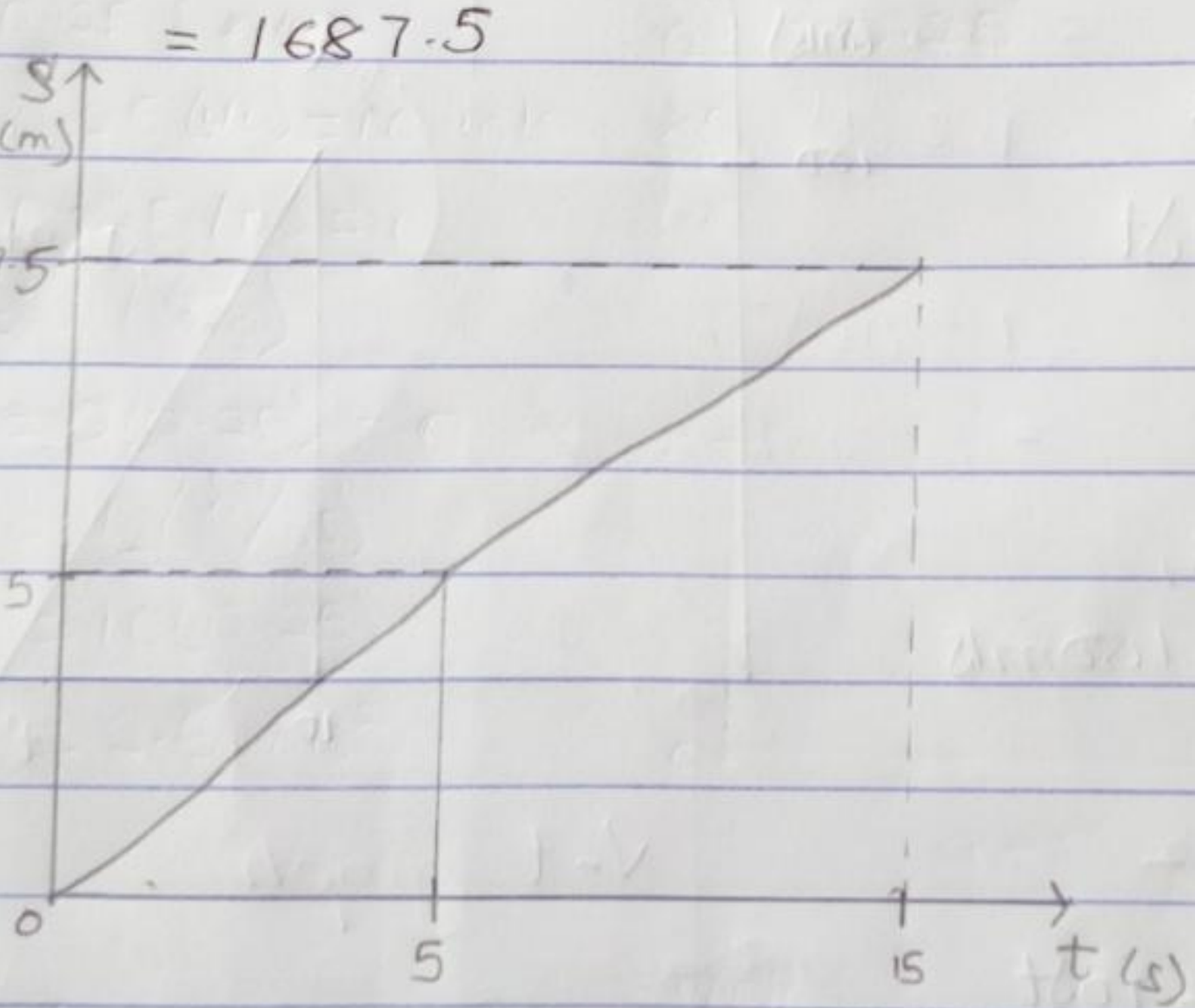
$$\int_5^s ds = \int_0^t -15t + 225$$

$s = -7.5t^2 + 225t$

when $t = 15$

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

$= 1687.5$



s-t graph

Total distance travelled during time interval is 1687.5m