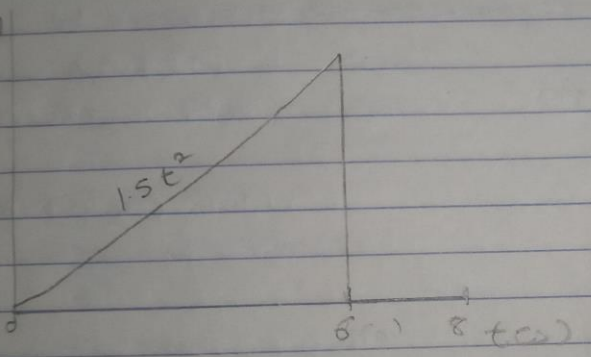
Kashaedo - Oluwegun Busola
18/ENG05/028
Mechatronics Engineering

i) since $v = \frac{\partial s}{\partial t}$, the v-t graph can be determined by differentiating the equations defining the s-t graph

$v = \frac{\partial s}{\partial t} = (i.5t^2)\ m/s$ at $0 \leq t \leq 6s$

then at $6 < t \leq 10s$; $s = 108m$

$v = \frac{ds}{dt} = 0$



ii) To construct the s-t graph

$0 \leq t < 10s$

since $\partial s = v\partial t$, integrating the equations of the v-t graph yields the corresponding equations of the s-t graph

$v = (-4t + 80)\ m/s$

$\int_0^s ds = \int_0^t 10t - 4t + 80\ dt$

$s = -2t^2 + 80t + C$

since at $s = 0$, $t = 0$

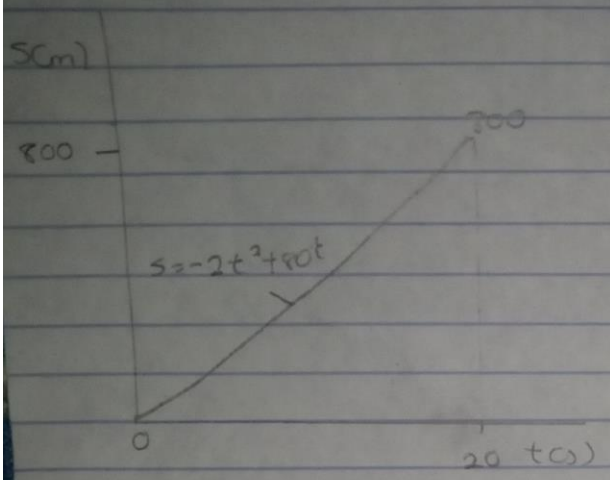
$0 = -2(0)^2 + 80(0) + C$

$\therefore C = 0$

at $t = 20s$

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

$= -800 + 1600 = 800m$

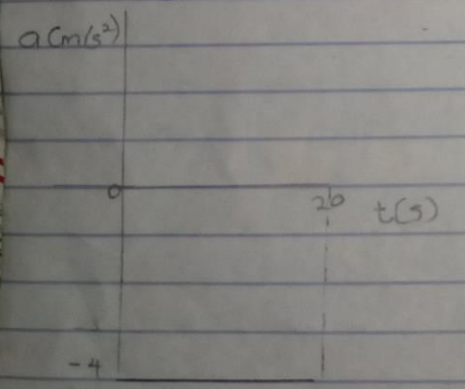


(iv) The a-t graph of the motion

since $a = \frac{\partial v}{\partial t}$, the a-t graph can be determined by

$0 \leq t < 20s$, $v = -4t + 80$

$a = \frac{\partial v}{\partial t} = -4 m/s^2$



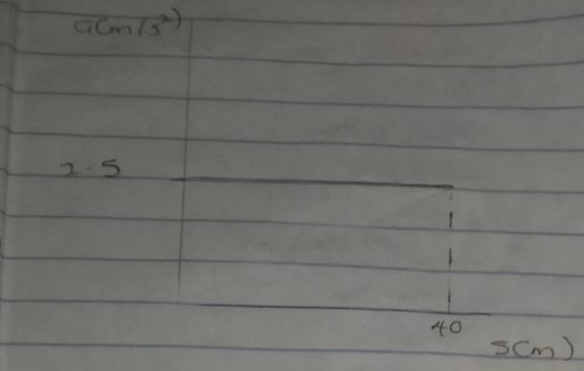
(v) to get the a-s graph

$a = v \frac{dv}{ds}$

$a = v \times 0.25$

$a = 10 \times 0.25$

$a = 2.5 m/s^2$



(v) to construct the v-t graph

$$v = \frac{\partial s}{\partial t}$$

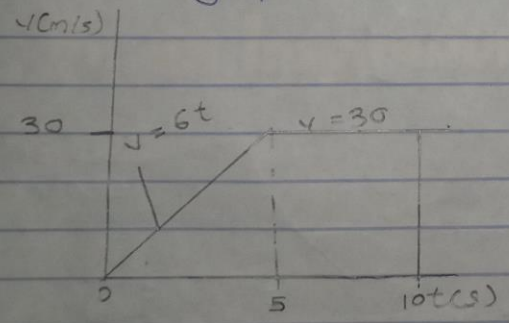
at $0 < t \leq 5s$

$$v = \frac{ds}{\partial t} = 6t\ m/s$$

at $5 \leq t < 10s$

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

v-t graph



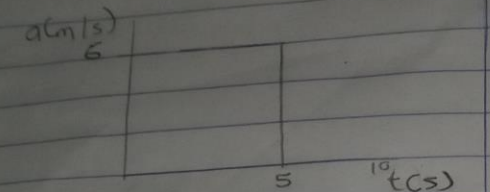
to construct the a-t graph

at $0 < t \leq 5s$

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

at $5 \leq t < 10s$

$$a = \frac{\partial v}{\partial t} = 0\ m/s^2$$



v) to construct the v-t graph

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

$\int_0^a a = \int_5^{20}$

$v = \int dv$

$v = \int_5^{20} 20t$

$v = 20t$

when $t = 5s$

$v = 20(5) = 100 m/s$

at

$10s \leq t \leq t'$

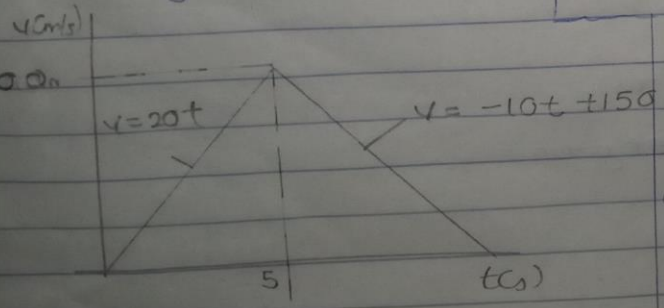
$a = -10 m/s^2$

$\int_5^v v\, dv = \int_5^{t'} -10\, dt = \int_5^t -10t$

$v = -10t + 150 m/s$

when $t = t'$

v - t graph



6) to construct the s-t graph

$\partial s = v\, \partial s$

$0 < t < 5$

$v = 20t\, m/s$

$\int_0^s ds = \int_0^t 20t\, dt$

$s = (5t^2)m$

when $t = 5s$

$s = 5(5)^2 = 125m$

using this condition

$5s \leq t \leq 15s$

$v = -10t + 150$

$\int_{125}^s \partial s = \int_5^t -10t + 150$

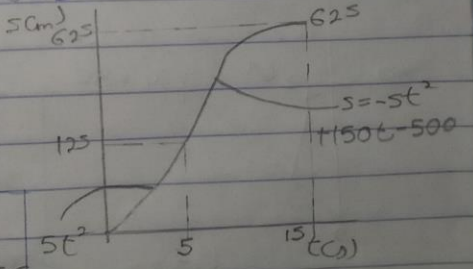
$s - 125 = -5t^2 + 150t - (-(5)^2 5 + 150(5)$

$s = -5t^2 + 150t - (-125 + 750) + 125$

$s = -5t^2 + 150t - 500$

$s = -1125 + 2250 - 500$

$s = 625m$



total distance travelled

using ~~$s = ut + \frac{1}{2}at^2$~~

= area 1 + area 2

$= \frac{1}{2} \times 5 \times 100 + \frac{1}{2} \times 10 \times 100$

$= 250 + 500$

$= 750m$