BAKARE KEHINDE HAMMEEDAT
19/ENG03/032
CIVIL ENGINEERING
ENG 234: ENG MECHANICS.

1. For the v-t graph

At time $0 \leq t < 6$ secs

$S = 0.5t^3$

using the relationship $v = \frac{ds}{dt}$

$v = 1.5t^2$

At time $6 \leq t \leq 10$ secs

$S = 108$

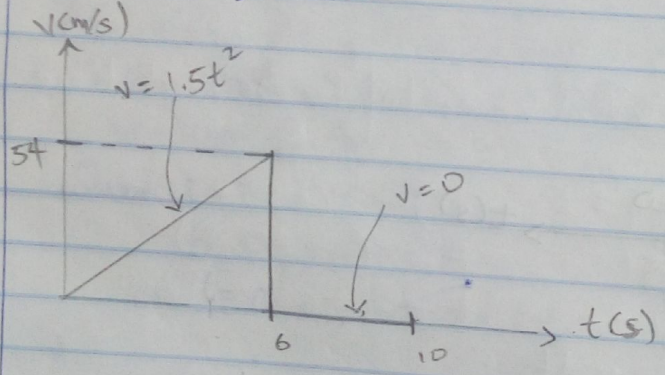
$\therefore v = 0$

At $t = 0$, $v = 0$

$t = 6$, $v = 54$

$t = 8$, $v = 0$

$t = 10$, $v = 0$



2. For the s-t graph

At time $0 \leq t < 20$ secs

using the relationship $s = \int v\,dt$

$v = -4t + 80$

$s = \int -4t + 80\,dt$

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

since $s = 0$ when $t = 0$

$0 = 0 + 0 + C$

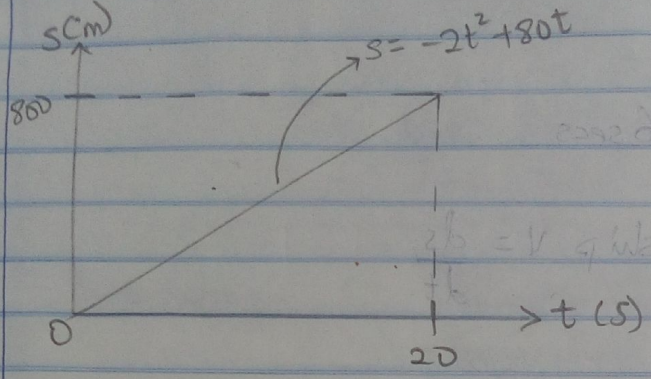
$C = 0$

$\therefore s = -2t^2 + 80t$

When $t=0$, $s=0$

$t=10$, $s=600$

$t=20$, $s=800$



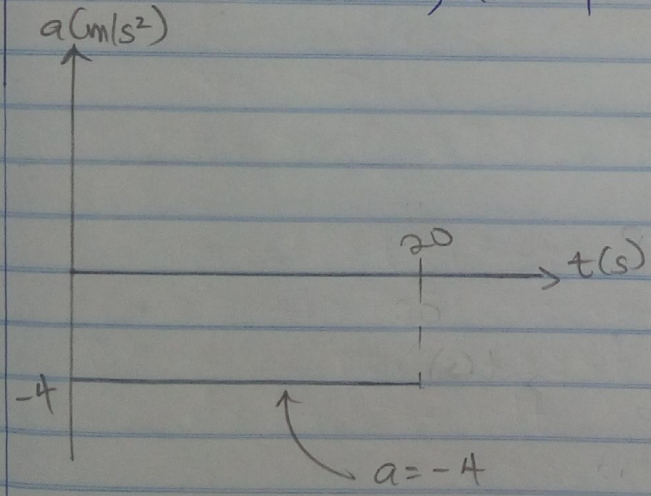
For the a-t graph

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

$$a = -4$$

at time $t=0$, $a=-4$

$t=20$, $a=-4$



3. For the a-s graph

at $0 \leq t \leq 40$

$v = 0.25s$

Using the relationship

$$ads = v\,dv$$

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

$$\frac{dv}{ds} = 0.25$$

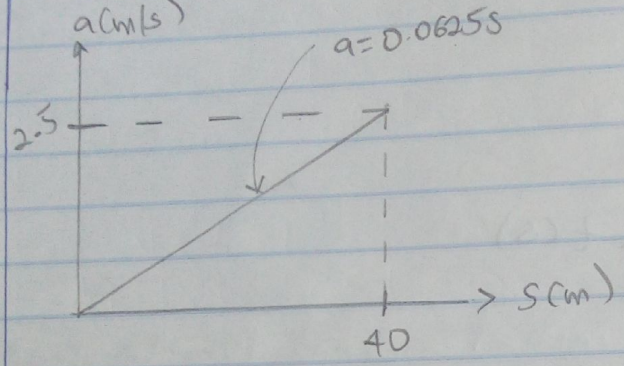
$a = 0.25 \times 0.25 s$

$a = 0.0625 s$

at $s = 0$, $a = 0$

$s = 20$, $a = 1.25 m/s^2$

at $s = 40$, $a = 2.5 m/s^2$



4. For the v-t graph

At time $0 \leq t < 5$ secs

$s = 3t^2$

$v = 6t$

At time $5 \leq t \leq 10$ secs

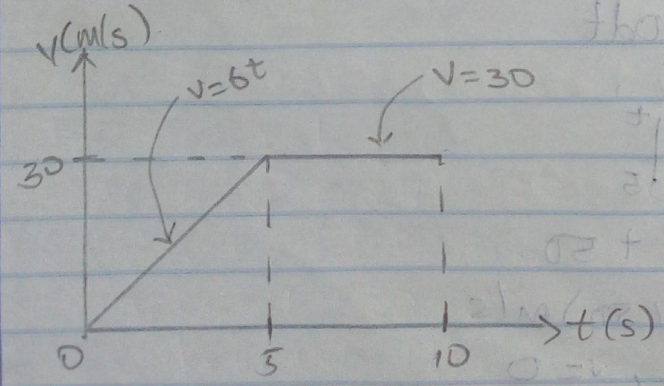
$s = 30t - 75$

$v = 30$ (m/s)

when $t = 0$, $v = 0$

$t = 5$, $v = 30$

$t = 10$, $v = 30$



For the a-t graph

At time $0 \leq t < 5$

$v = 6t$

$a = 6$

At time $5 \leq t \leq 10$

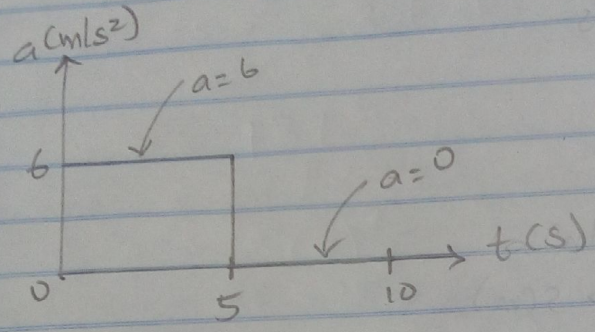
$v = 30$

$a = 0$

When $t = 0$, $a = 6$

$t = 5$, $a = 6$

$t = 10$, $a = 0$



5 $0 \leq t < 5$

$$v = \int_0^5 20\,dt$$

$$v = 20t \Big|_0^5$$

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

using this as the initial condition for the next time period

$5 \leq t < t'$

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

$$\int_{100}^{v} dv = \int_5^{t'} -10\,dt$$

$$v - 100 = -10 \Big|_5^{t'}$$

$v - 100 = -10t' + 50$

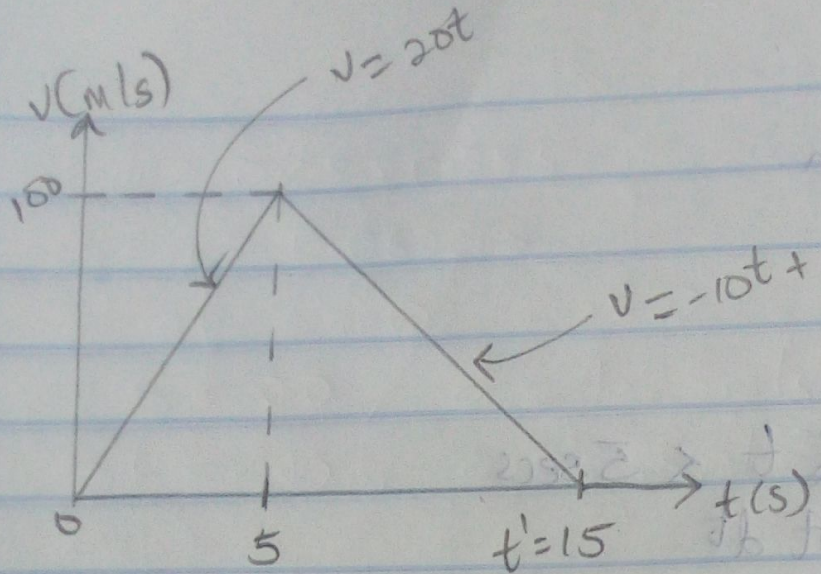
$v = (-10t' + 150) \text{ m/s}$

when $t = t'$, $v = 0$

$0 = -10t' + 150$

$10t' = 150$

$t' = 15 \text{ s}$



6. For the s-t graph

At time $v = 30t$

$$s = \int_0^5 30t \, dt$$

6. For the s-t graph

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

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

At time $0 \leq t < 5$ secs

$$\int_0^s ds = \int_0^5 30t\,dt$$

$$s = 15t^2$$

when $t = 5$ s

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

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

using this as the initial condition for the next time frame.

at time $5 \leq t \leq 15$ secs

$$v = (-15t + 225) \text{ m/s}$$

$$\int_{375}^{s} ds = \int_{5}^{t} (-15t + 225)$$

$$s - 375 = -7.5t^2 + 225t \Big|_5^t$$

$$s - 375 = (-7.5t^2 + 225t) - [(-7.5 \times 5^2) + (225 \times 5)]$$

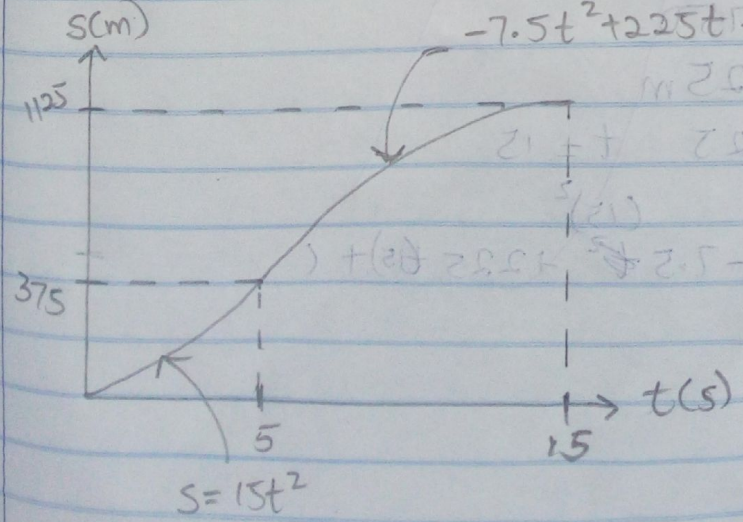
$$s - 375 = -7.5t^2 + 225t - (937.5)$$

$$s = (-7.5t^2 + 225t - 562.5) \text{ m}$$

when $t = 15$ s

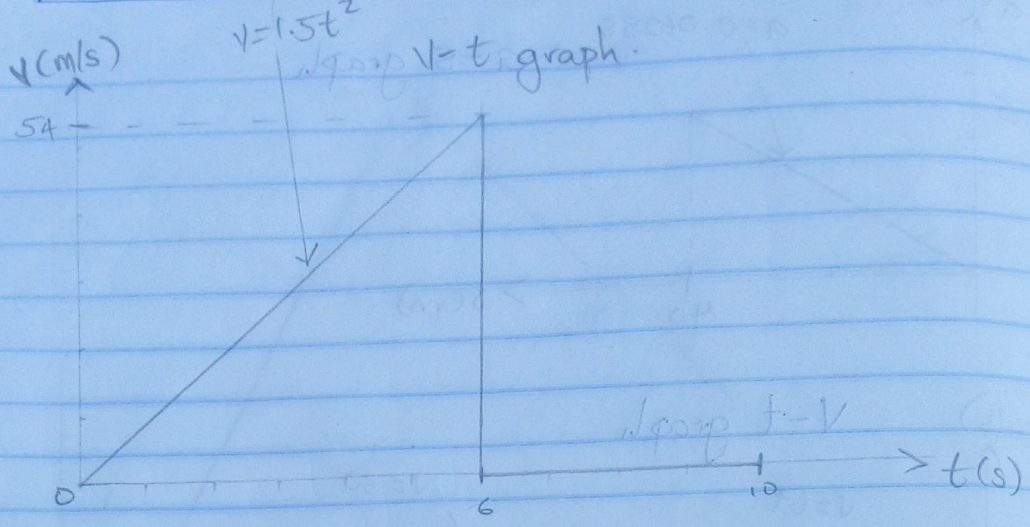
$$s = (-7.5(15^2) + 225(15) - 562.5)$$

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

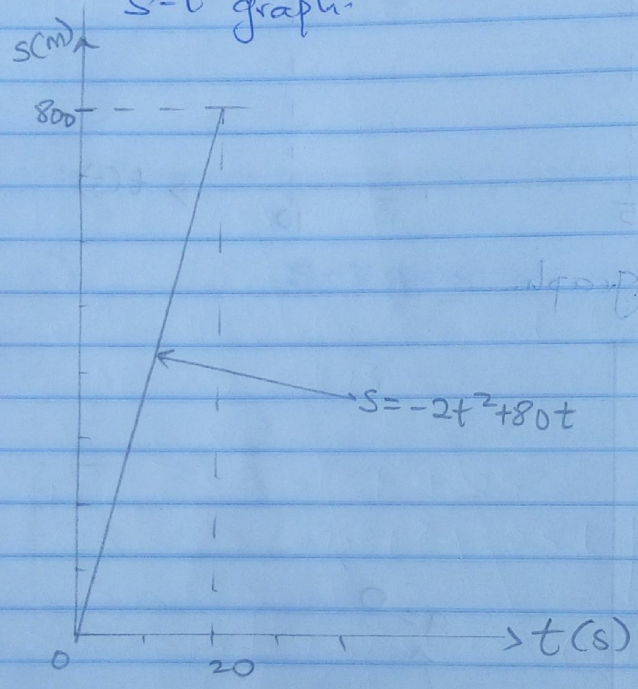


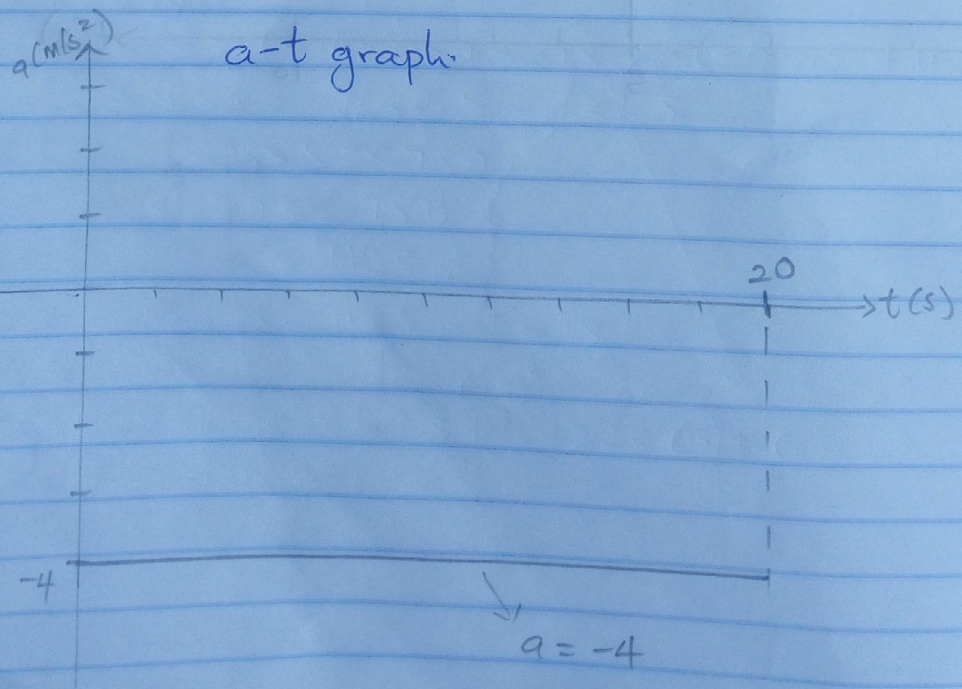
ALL GRAPHICAL SOLUTIONS DRAWN TO SCALE

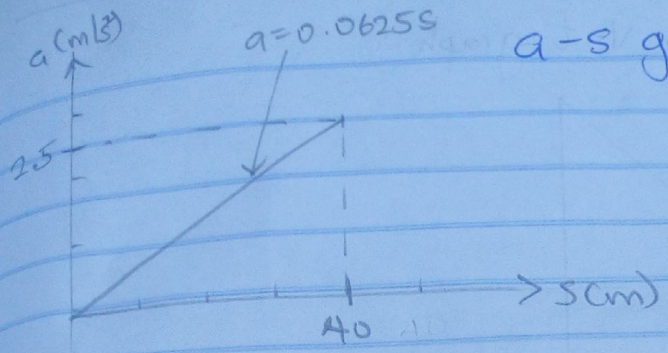
1. $v = 1.5t^2$



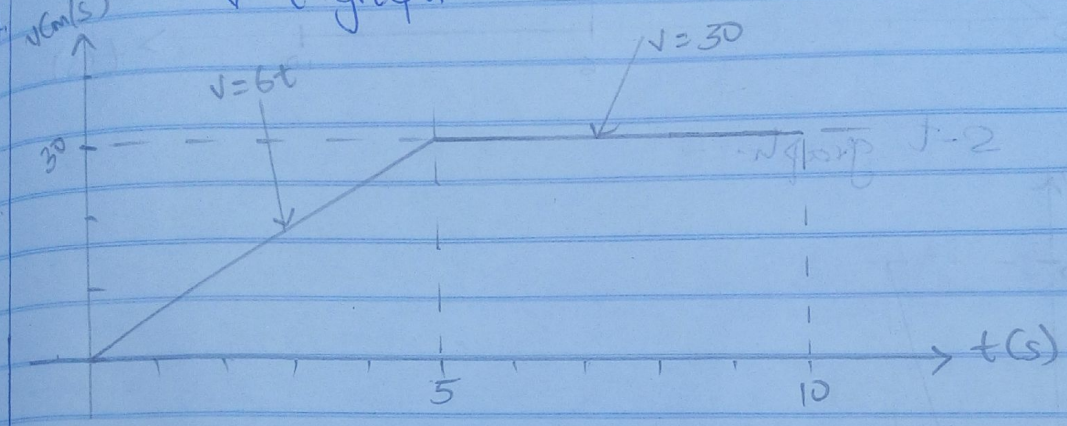
2. s-t graph.



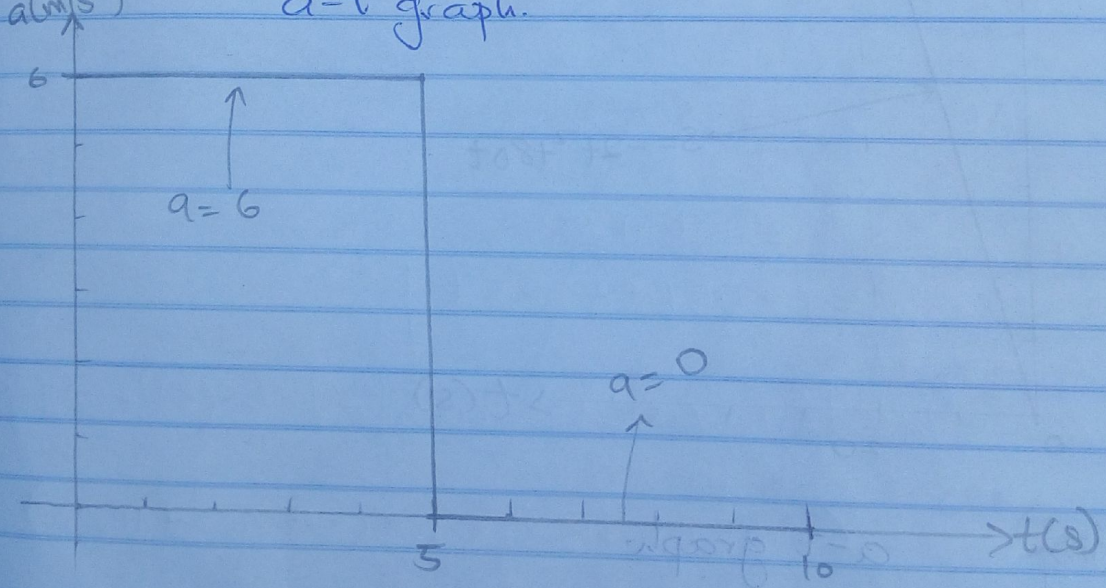




a-s graph

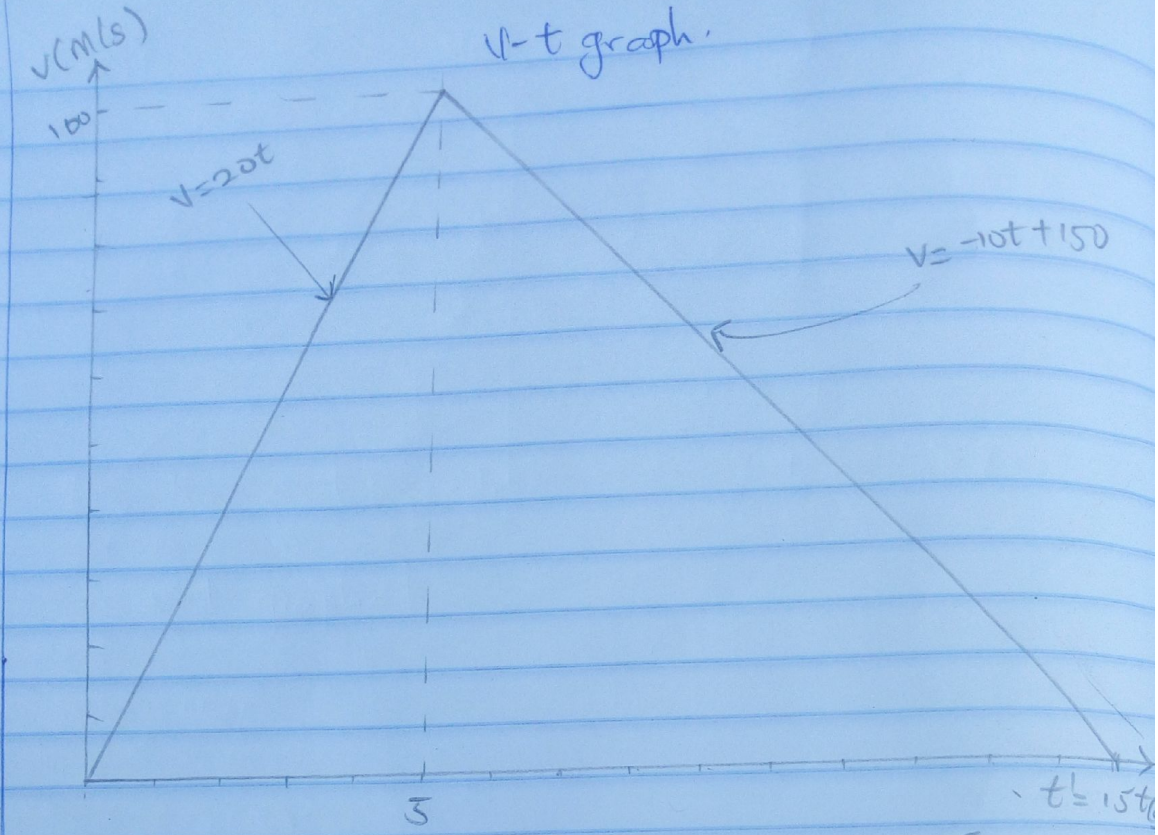


V-t graph



a-t graph.

5.



6.