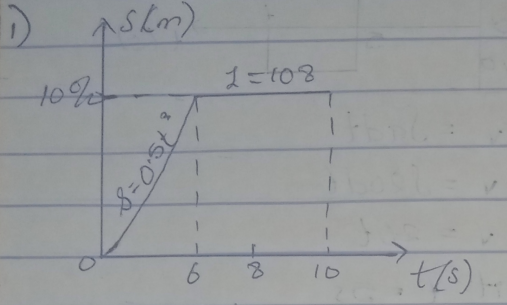
OKEKE CHIDERA SAMUELLA

18/ENG08/1014

Biomedical Engineering

Mechanics Assignments

1) 

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

$= 1.5t^2$

at $t = 6sec$

$v = 1.5 \times 6^2$

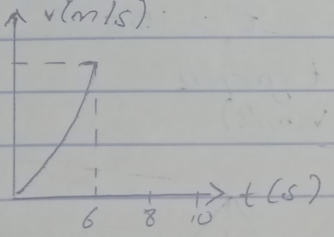
$= 1.5 \times 36$

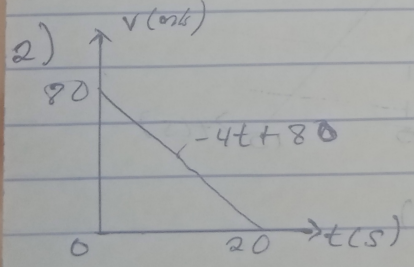
$= 54m/s$

from $t = 6s - 10s$, $s = 10$

$\therefore v = 0$

v-t graph



2) 

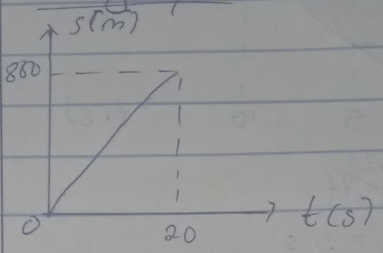
i) $s = \int v\,dt = \int(-4t + 80)$

$= -2t^2 + 80t$ at $t = 20sec$

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

$s = 1600 - 800 = 800m$

s-t graph

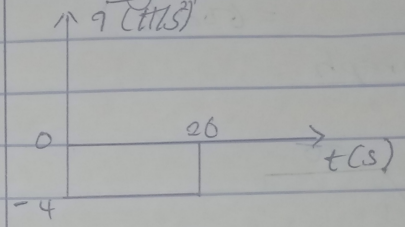


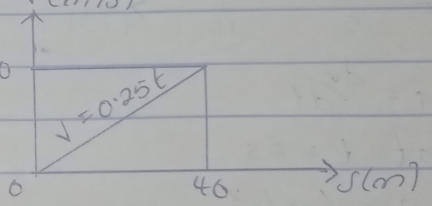
ii) acceleration

$a = dv/dt$

at $t = 20s$, $a = 4m/s^2$

a-t graph



3) 

$a = (dv/ds)v$

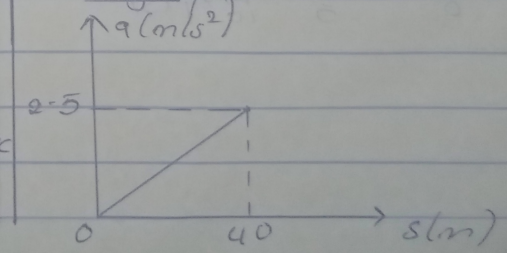
$v = 0.25s$

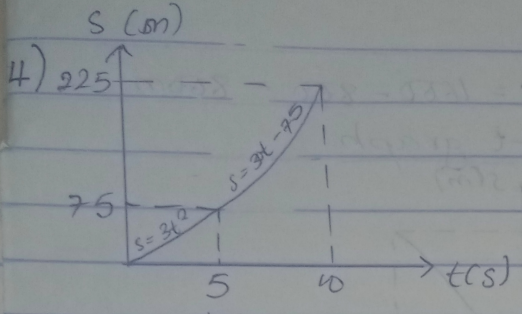
$a = 10 \times d(0.25s)/ds$

$a = 10 \times 0.25$

$a = 2.5m/s^2$

a-s graph



4) 

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

at $t = 5s$

$v = 6t = 6 \times 5$

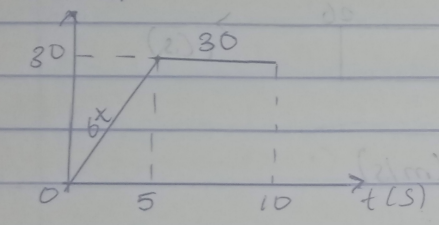
$= 30 m/s$

at $t = 10s$

$v = 6t = 6 \times 5$

$= 60 m/s$

v-t graph



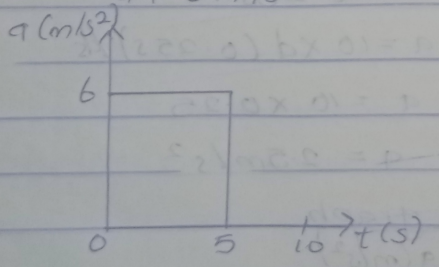
ii) $a = \frac{dv}{dt}$

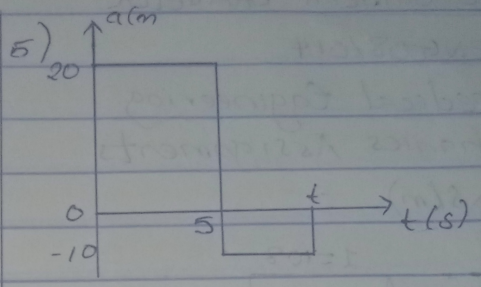
at $t = 5s$

$a = 6 m/s^2$

at $t = 10s$

$a = 0 m/s^2$



5) 

i) $v = \int a dt$

$v = \int 20 dt$

$v = 20t$

at $t = 5s$

$v = 20 \times 5 = 100 m/s$

$5s < t \leq t_1$

$\int_{100}^{v} dv = \int_{5}^{t} -10 dt$

$v - 100 = -10t \Big|_5^{t_1}$

$v - 100 = -10t' + 10(5)$

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

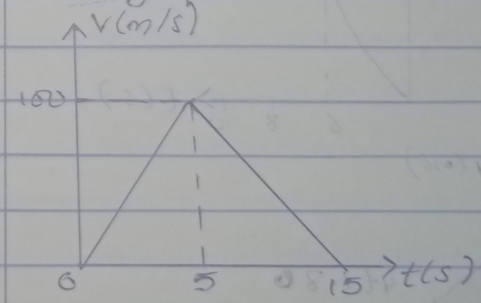
at t', $v = 0$

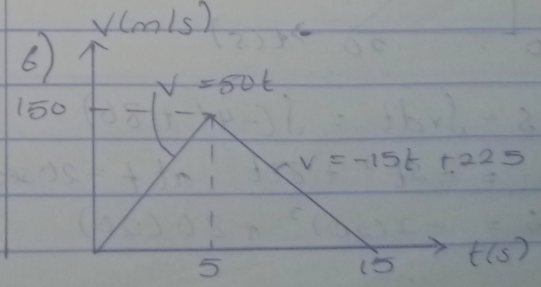
$0 - 100 = -10t + 50$

$10t' = 150$

$t' = 15s$

v-t graph



6) 

$0 \leq t \leq 5s$

$v = 30t$

$\int_0^3 ds = \int_0^5 80t$

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

$s = 15(5)^2 - 15(0)^2$

$s = 15 \times 25$

$s = 375m$

$5_s \leq t \leq 15_s$

$v = -15t + 225$

$\int_{375}^3 ds = \int_5^{15} (-15t + 225)\, dt$

$s - 375 = \frac{-15t^2}{2} + 225t \Big|_5^{15}$

$s - 375 = \left[\frac{-15(15^2)}{2} + 225(15)\right] - \left[\frac{-15(5)^2}{2} + 225(5)\right]$

$s - 375 = \left[\frac{-15 \times 225}{2} + 3375\right] - \left[\frac{-15 \times 25}{2} + 1125\right]$

$s - 375 = (-1687.5 + 3375) - (-187.5 + 425)$

$s - 375 = 1687.5 - 987.5$

$s - 375 = 750$

$s = 750 + 375$

$= 1125m$

s-t graph