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Dept: Elect Effect
MAT NO: 18/ENG04/1021

Solution

1) Since $v = \frac{ds}{dt}$ the v-t graph can be determined by differentiating the equation

$0 \leq t < 6s$, $S = 0.5t^2$

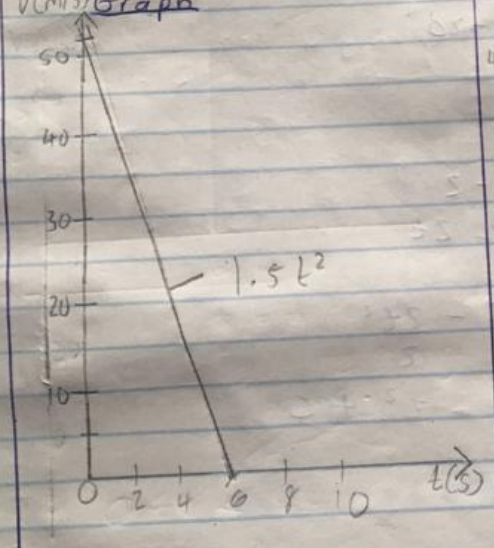
$v = \frac{ds}{dt} = 1.5t^2 m/s$

$= 54 m/s$

$6 \leq t < 10s$, $S = 10s$

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

V(m/s) Graph



10) S-t graph

~~Since~~ The S-t graph is determined by integrating the equation

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

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

$S = -2t^2 + 80t$

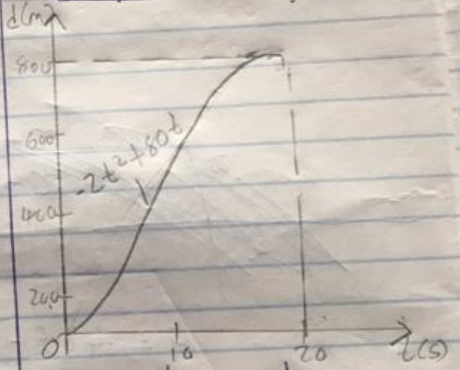
when $t = 20$

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

$= -800 + 1600$

$= 800 m$

Graph



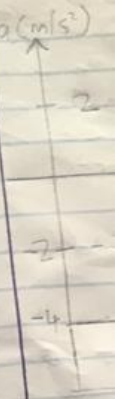
~~Ex~~ a-t graph

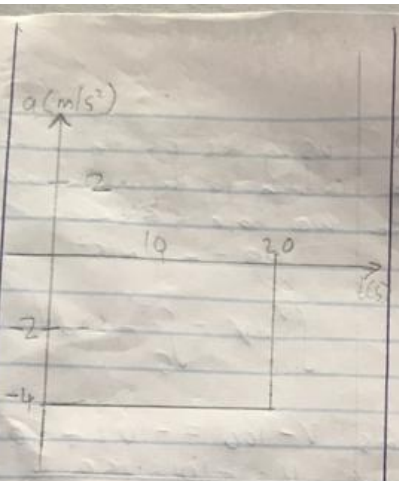
the a-t graph is determined by differentiating the equation

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

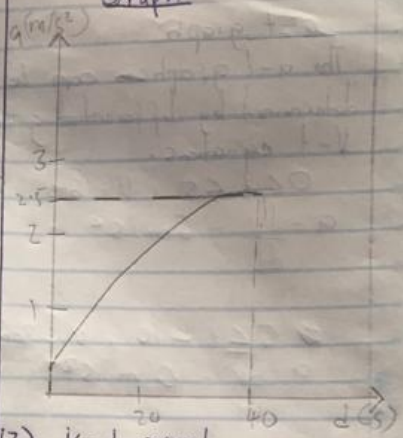
$a = \frac{dv}{dt} = -4$

ii) with $\frac{dv}{ds}$ "a"





Graph



(ii) with the values of V and $\frac{dV}{ds}$ known, the value of "a" can be calculated

$0 \leq s < 40$

$V = 0.25s$

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

$V = 10 m/s$

$a = \frac{dV}{ds} \times 0.25$

$a = V \times \frac{dV}{ds}$

$a = 10 \times 0.25$

$a = 2.5 m/s^2$

(iii) v-t graph

the v-t graph can be constructed by differentiating the equations

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

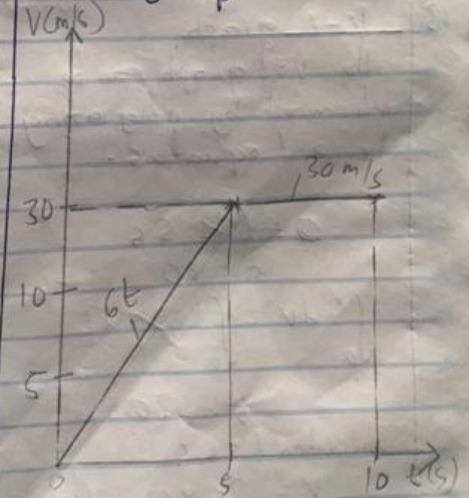
$V = \frac{ds}{dt} = 6t = 6(5)$

$= 30 m/s$

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

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

Graph



a-t graph

The a-t graph can be determined by differentiating the V-t equations.

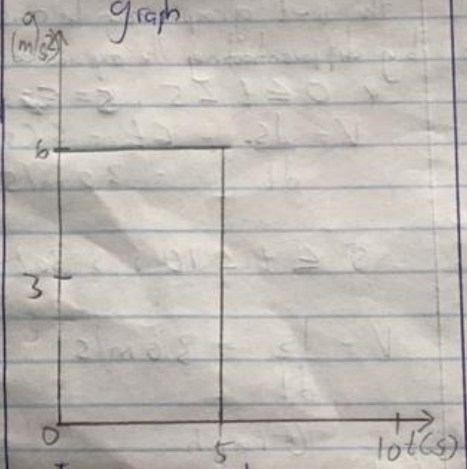
$0 \leq t < 5$, $V = 6t$

$a = \frac{dv}{dt} = 6 m/s^2$

$5 \leq t < 10$, $V = 30 m/s$

$a = \frac{dv}{dt} = 0 m/s^2$

graph



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V-t graph.

The V-t graph can be determined by integrating the a-t equations.

$0 \leq t < 5s$

$a = 20$

$\int_0^v dv = \int_0^t 20\,dt$

$v = 20t$

when $t = 5s$

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

using this as the initial condition for the next time period we have $5 \leq t < t'$

$a = -10 m/s^2$

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

$V - 100 = -10t + 50$

$V = -10t + 150$

when $t = t'$

$V = 0$

$0 = -10t + 150$

$10t = 150$

$t' = 15s$

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Graph