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Assignment

1) $v = \frac{ds}{dt}$ $s = 0.5t^2$, $v = \frac{\partial}{\partial t} = 0.5t^3$

$\therefore v = 1.5t^2$

$t = 6s$

$v = 1.5(6)^2$

$= 1.5 \times 36 = 54 m/s$

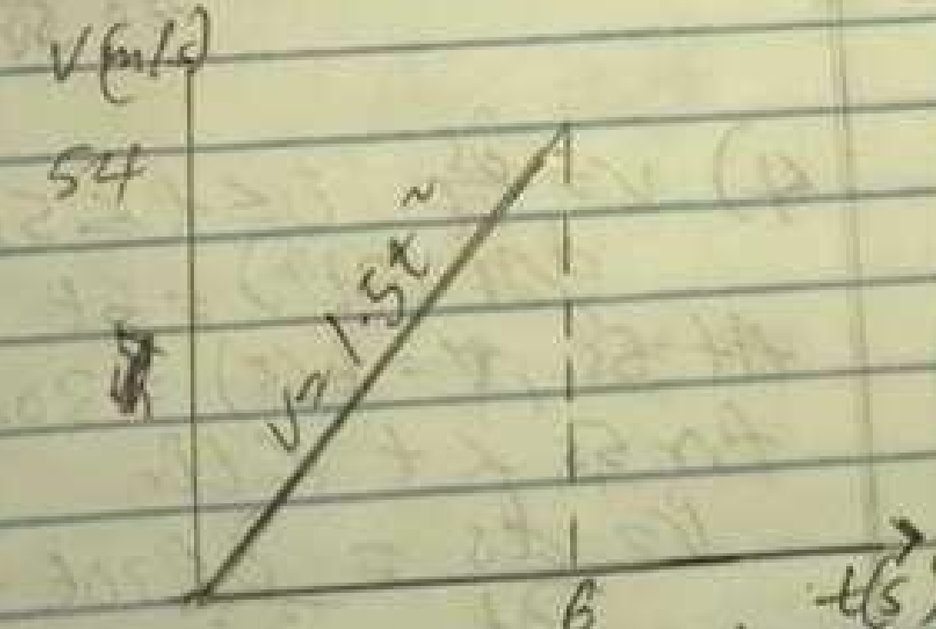
$6s \leq t \leq 10s$

$s = 108m$

$v = \frac{ds}{\partial t}$ $v = \frac{\partial}{dt}(108)$

$v = 0$

The v-steady-time graph shown below



2) $v = \frac{ds}{dt}$ $ds = vdt$

$\int_0^t ds = \int_0^t v\,dt$

$0 \leq t \leq 20$

$v = -4t + 80$

$s = \int_0^t (-4t + 80)\,dt$

$s = \left[\frac{-4t^2}{2} + 80t\right]_0^t = -2t + 80t$

When $t = 20$

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

$= -800 + 1600$

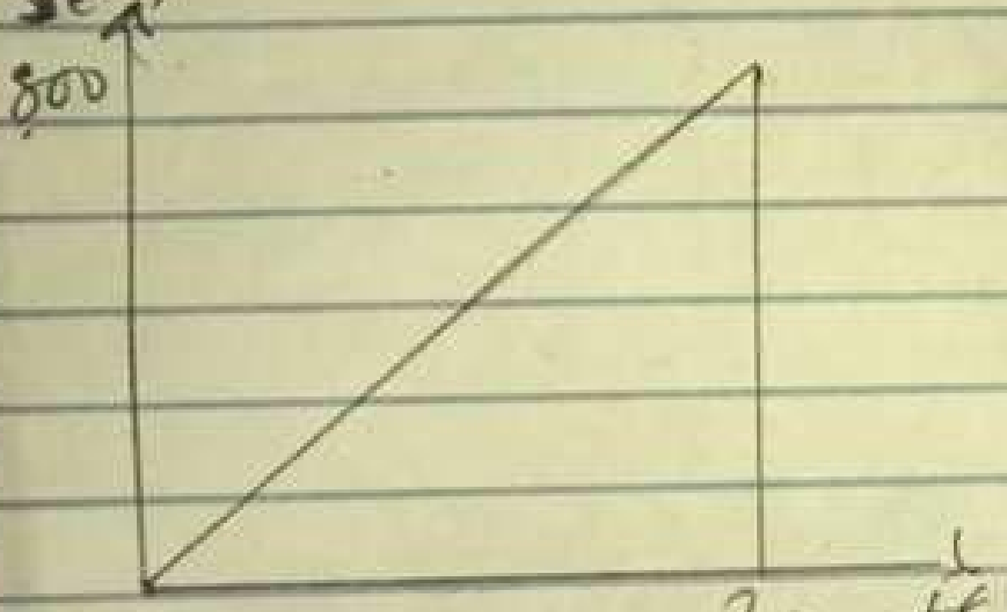
$s = 800$

When $t = 0$

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

$s = 0$

The distance-time graph is shown below



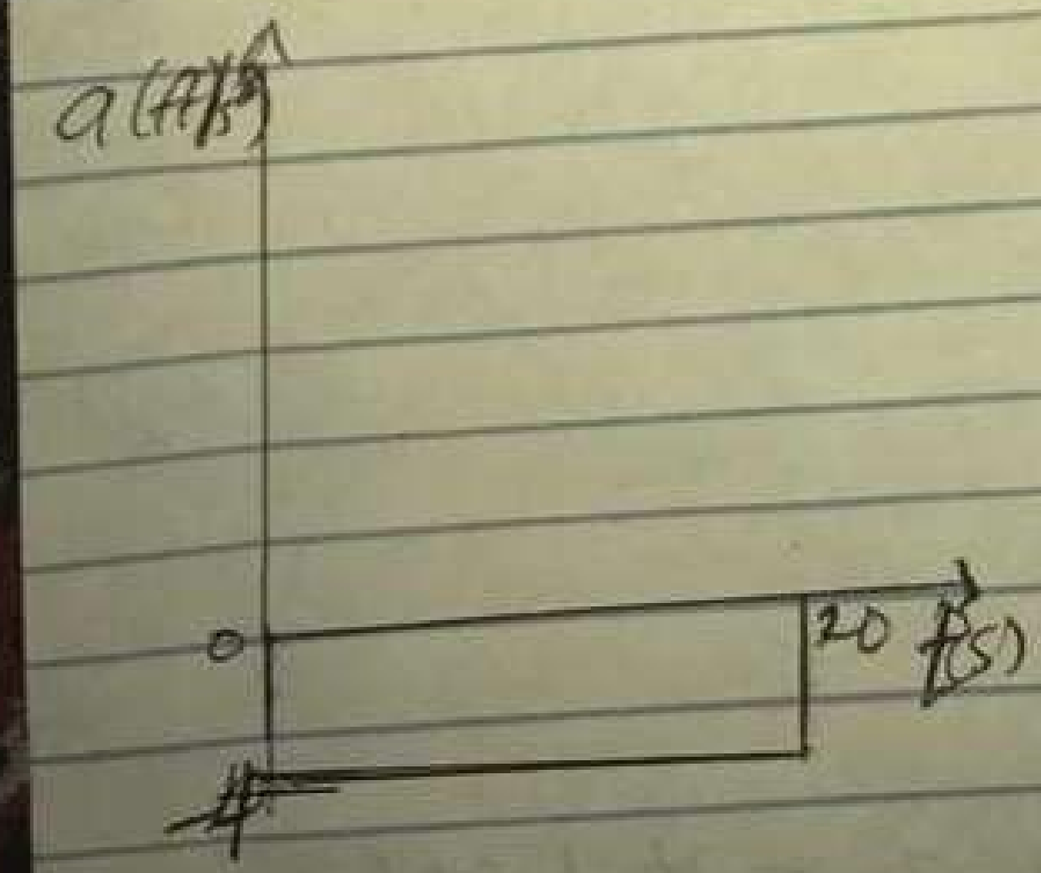
for acceleration-time graph

$a = dv/dt$

$v = -4t + 80$

$a = \frac{d(-4t + 80)}{dt}$

$a = -4 ft/s^2$



3) $a = \frac{v ds}{dt}$

$0 \leq t \leq 40m$

$V = 0.25 m/s$

$a = 0.25 \times 0.25$

$a = 0.0025 (m/s^2)$

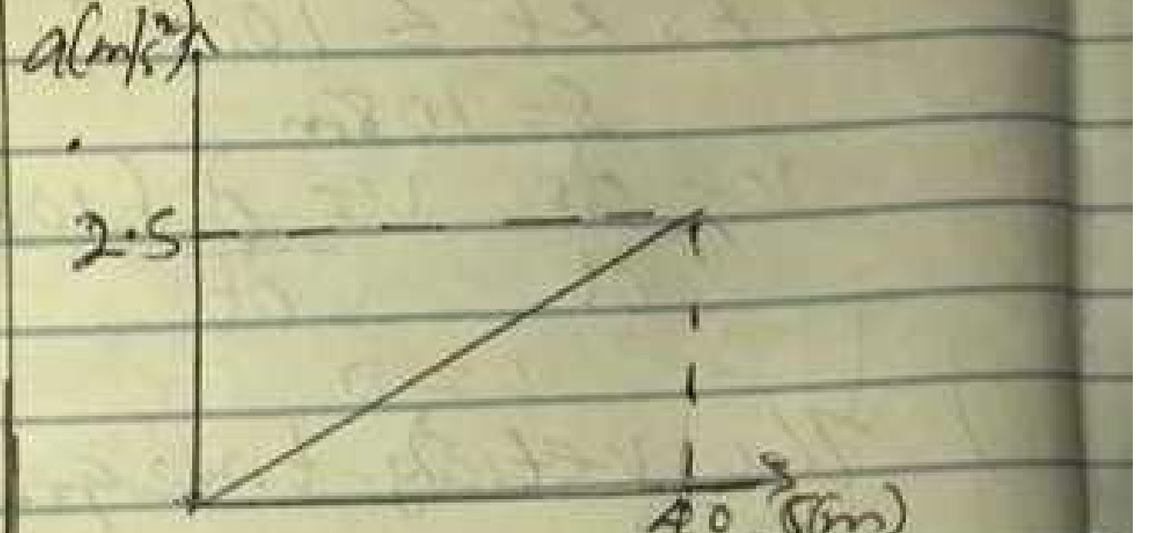
When $s = 40m$

$a = 0.0025 \times 40$

$a = 2.5 m/s$

When $s = 0m$, $a = 0 m/s^2$

The acceleration-distance graph:



4) $v = \frac{ds}{dt}$ $0 \leq t \leq 5s$, $s = 3t^2$

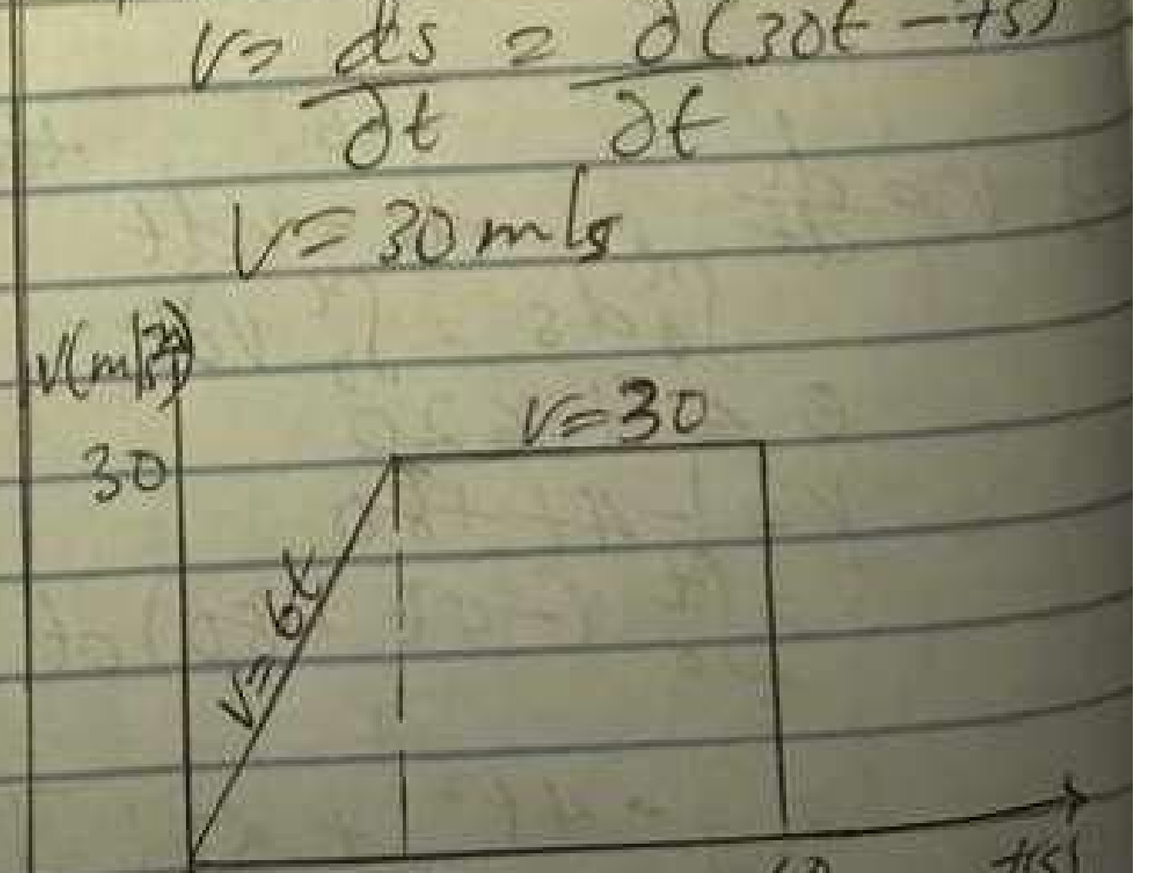
$\frac{d}{dt}(3t^2) = 6t$

At $5s$, $v = 6(5) = 30 m/s$

For $5s < t < 10s$

$v = \frac{ds}{\partial t} = \frac{\partial(30t - 75)}{\partial t}$

$v = 30 m/s$



Above is the v-t graph

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

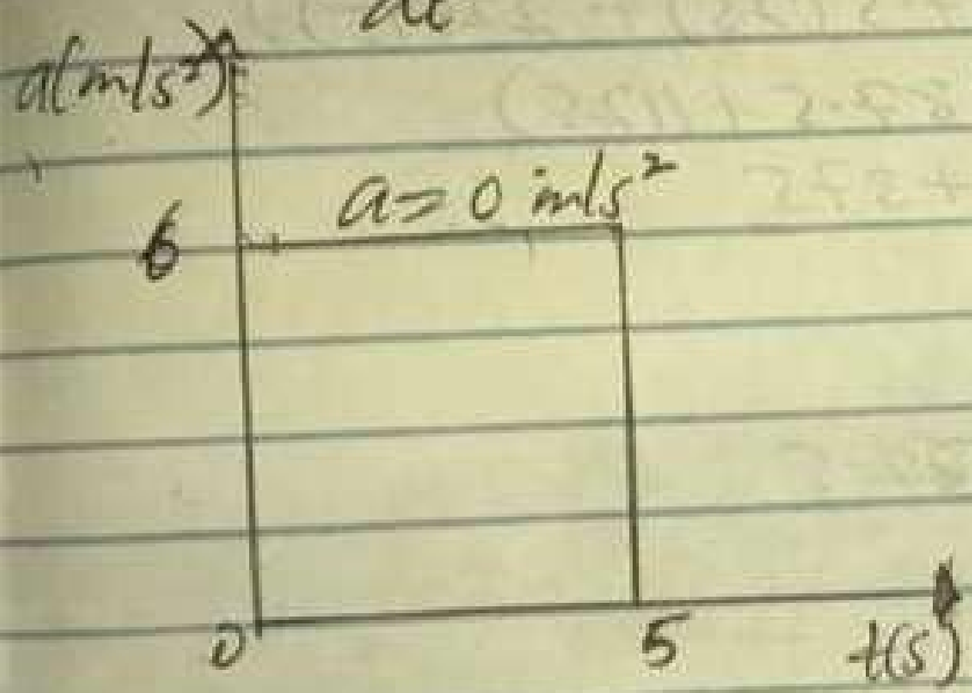
$a = \frac{dv}{dt} = \frac{d(6t)}{dt}$

For $5s \leq t \leq 10s$

$v = 30$ m/s

$a = dv/dt$

$= \frac{d(30)}{dt} = 0$



a-t graph

5) $a = \frac{dv}{dt}$, $dv = adt$

$\int_0^t dv = \int_0^t a\,dt$

for $0 \leq t \leq 5s$, $a = 20$

$dv = adt$

$\int dv = \int_0^t a\,dt$

$v = 20t$

When $t = 5$

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

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

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

$dv = adt$

$\int_{100}^{v} dv = \int_5^t a\,dt$

$v - 100 = \int_5^t -10\,dt$

$v = [-10t]_5^t + 100$

$v = -10t - (-50) + 100$

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

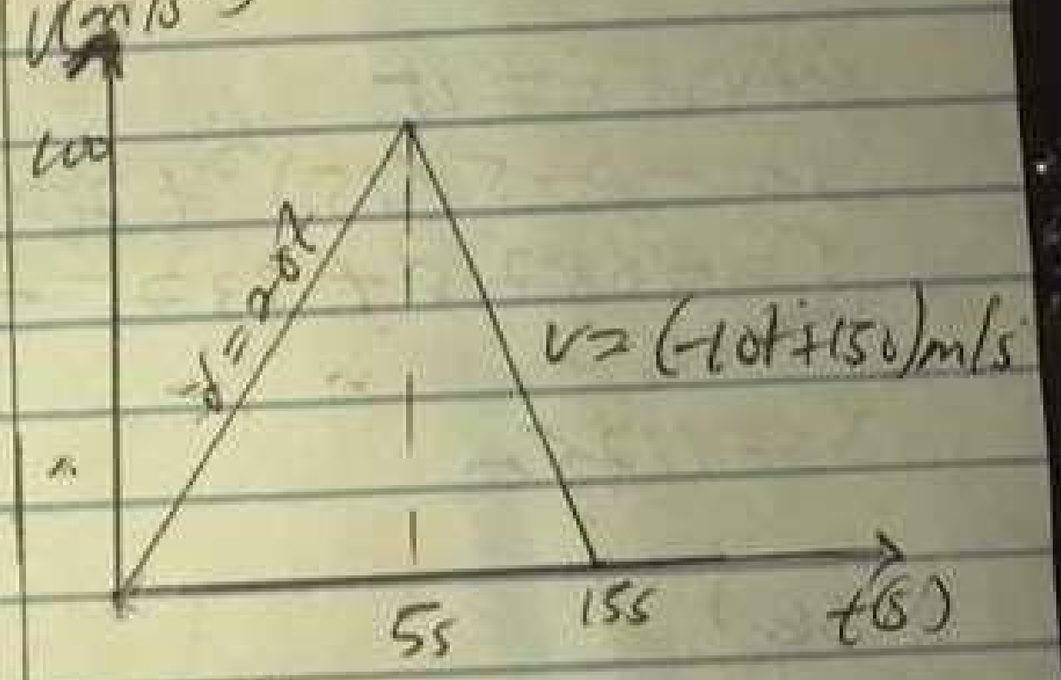
When $t = t'$, $v = 0$

$0 = 10t' + 150$

$10t' = 150$

$t' = 15s$

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



v-t graph

6) $v = \frac{ds}{dt}$, $ds = vdt$

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

$\int_0^s ds = \int_0^v v\,dt$

$s = \int 30t\,dt$

$s = \frac{30t^2}{2}$ m

$s = 15t^2$

When $t = 5$

$s = 15(5)^2$

$s = 15(25) = 375\ m$

$6s < t < 15s$; $v = 15t + 225$

$v = ds/dt$

$ds = v\,dt$

$\int_{375}^{s} ds = \int_{5s}^{t} v\,dt$

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

$s - 375 = (-7.5t^2 + 225t) - (-7.5(25) + 225(5))$

$s - 375 = -7.5t^2 + 225t - (-187.5 + 1125)$

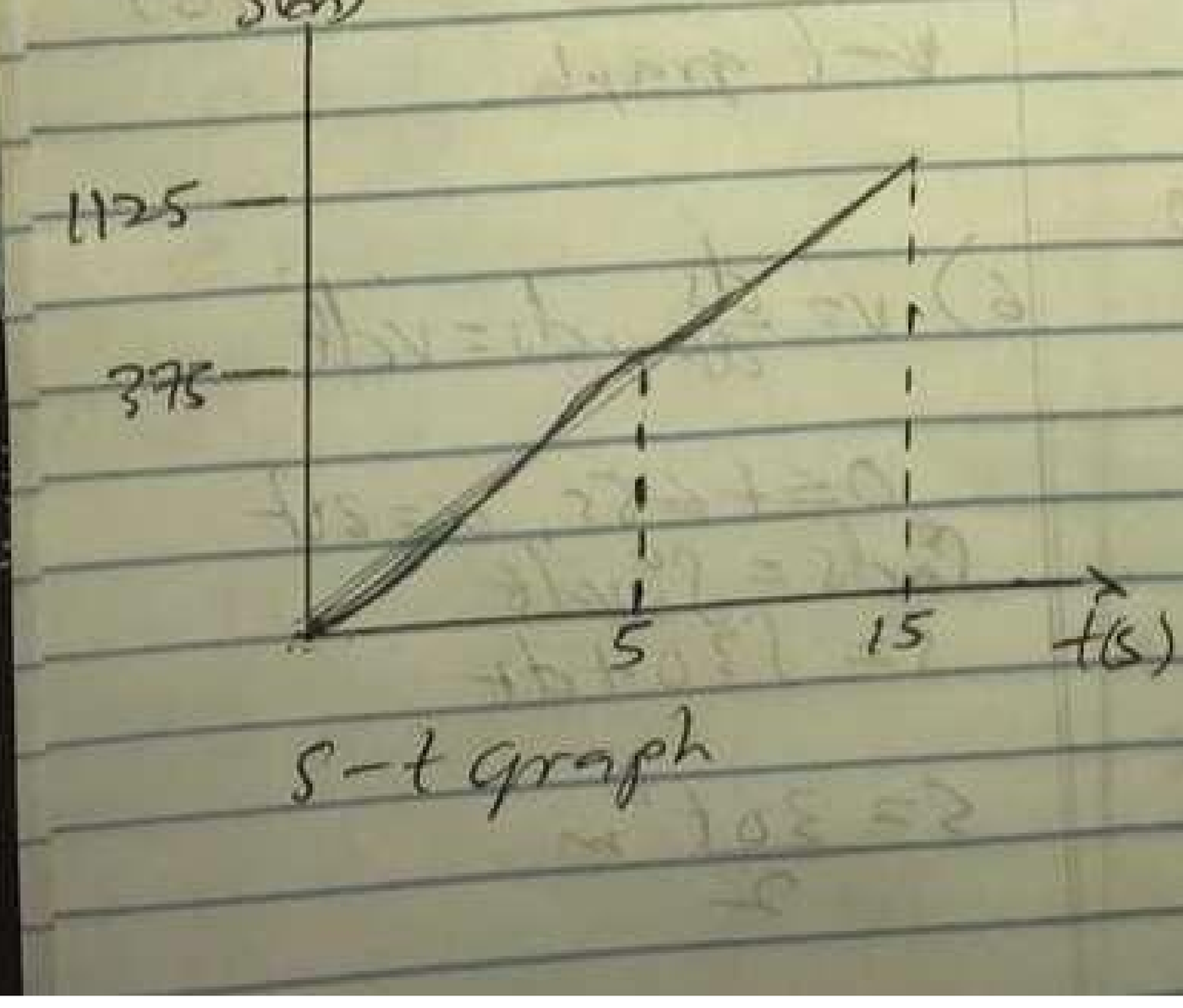
$s = -7.5t^2 + 225t - (937.5) + 375$

When $t = 15$

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

$s = -1687.5 + 3375 - 562.5$

$S = 1125\ m$



S-t graph