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ELECT/ELECT

Mech

$$1) \quad v = \frac{ds}{dt}$$

where $s = 0.5t^3$

put s in $\frac{ds}{dt}$

$$v = \frac{d}{dt} (0.5t^3)$$

$$v = 1.5t^2$$

at maximum velocity, $t = 6$

$$v = 1.5 \times (6)^2$$

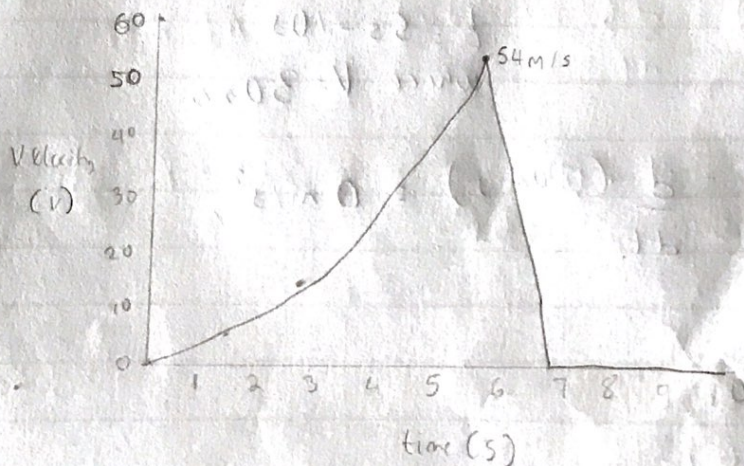
$$v = 1.5 \times 36 = 54 \text{ m/s}$$

also where $s = 108 \text{ m}$

$$v = \frac{d}{dt} (108)$$

$$v = 0$$

Graph (v-t)



$$2 \quad v = ds/dt \quad \text{where } s = 3t^2$$

$$v = \frac{d}{dt} (3t^2) = 6t \text{ m/s}$$

$$\text{from } t = 0 - 5s$$

$$v = 6(5) \text{ m/s} = 30 \text{ m/s} //$$

$$\text{from } t = 5s - 10s$$

$$\text{where } s = 30t - 75$$

$$v = \frac{d}{dt} (30t - 75) = 30 \text{ m/s}$$

when

acceleration

$$a = dv/dt$$

$$t = 0s - 5$$

$$\text{where } v = 6t$$

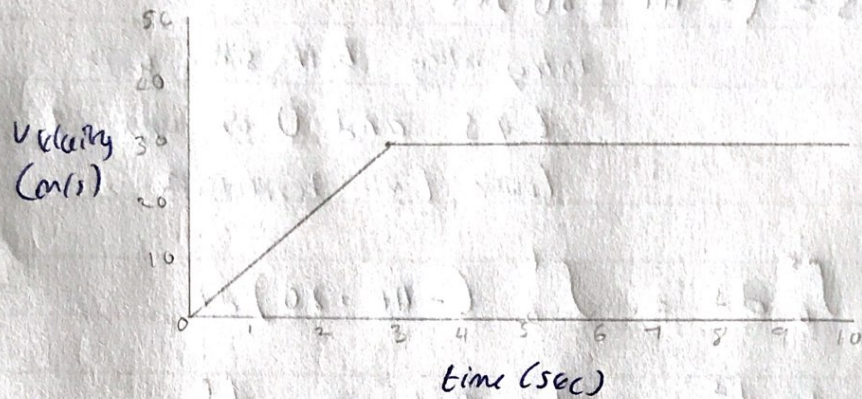
$$a = \frac{d}{dt} (6t) = 6 \text{ m/s}^2$$

$$t = 5s - 10s$$

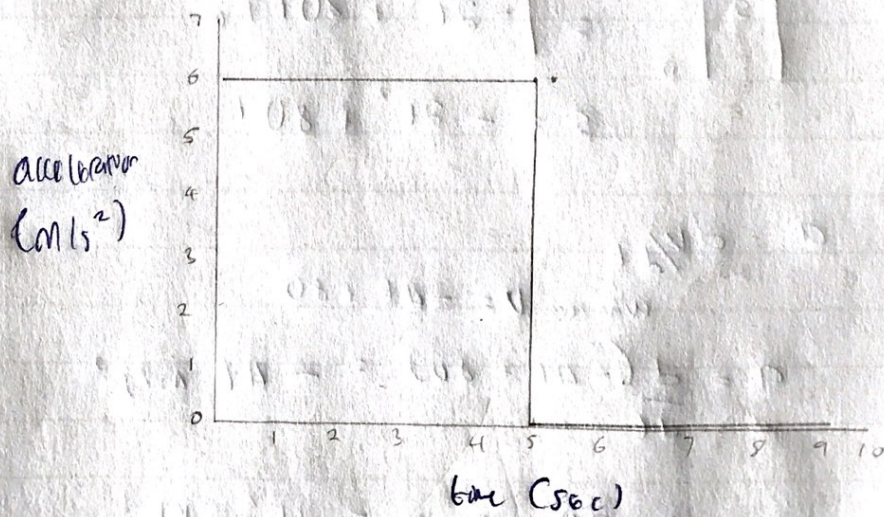
$$\text{where } v = 30 \text{ m/s}$$

$$a = \frac{d}{dt} (30 \text{ m/s}) = 0 \text{ m/s}^2 //$$

2. v-t graph



a-t graph



$$3 \quad v = \frac{ds}{dt} = ds = v dt$$

where $v = -4t + 80$

$$ds = (-4t + 80) dt$$

integrating both sides with
 t & s and 0 as upper &
 lower limit respectively.

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

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

$$|s|_0^s = |-2t^2 + 80t|_0^t$$

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

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

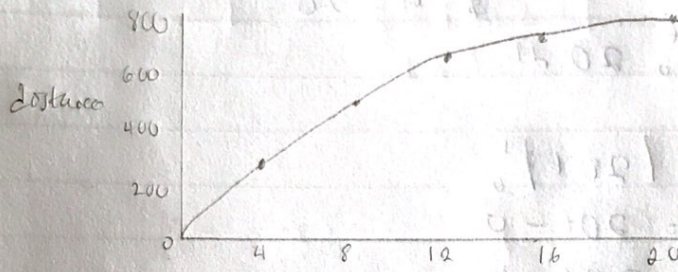
where $v = -4t + 80$

$$a = \frac{d(-4t + 80)}{dt} = \cancel{-4} \text{ m/s}^2 = 4 \text{ m/s}^2 //$$

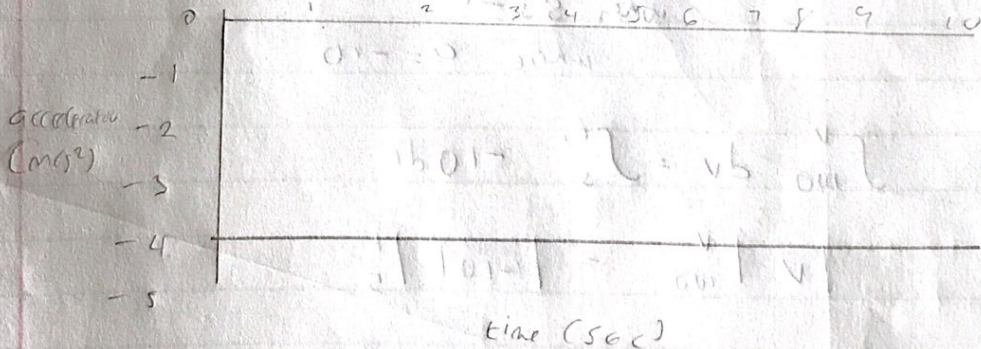
using	$t = 0 - 20, s = -2t^2 + 80t$
6	$s = -2t^2 + 80t$
0	0
4	288
8	512
12	672
16	768
20	800

3

S-t graph



a-t graph



$$4 \quad a = dv/dt$$

$$dv = a dt$$

when $t=0 - 5$

$$a = 20$$

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

$$|v|_0^v = |20t|_0^t$$

$$v - 0 = 20t - 0$$

$$v = 20t \text{ m/s}$$

when $t = 5$

$$v = 20(5) \text{ m/s}$$

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

when $5 \text{ s} - t'$

where $a = -10$

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

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

$$v - 100 = (-10t' + 50) \text{ m/s}$$

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

$$v = -10t' + 50 + 100 \text{ m/s}$$

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

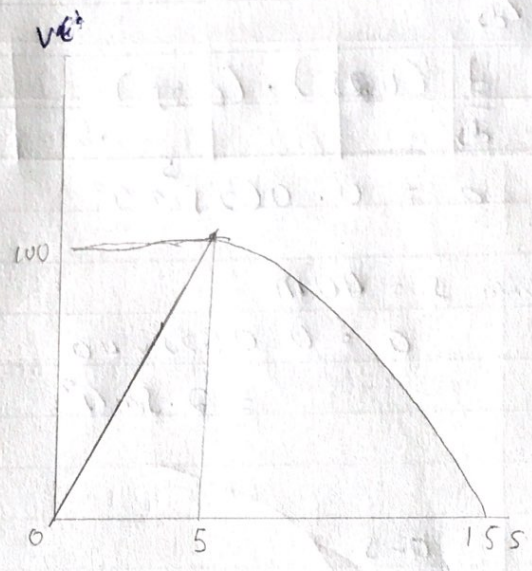
at rest $v = 0$

$$0 = 150 - 10t'$$

$$10t' = 150$$

$$t' = \frac{150}{10} = 15 \text{ s}$$

v-t graph



(a)

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

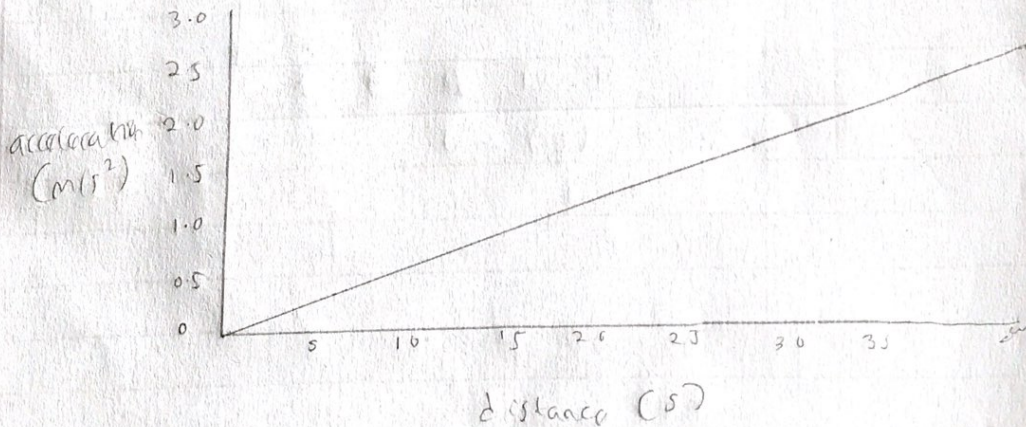
$$a = \frac{d}{ds} (0.25) \cdot (0.25)$$

$$a = 0.0625 \frac{m}{s^2}$$

$$\text{when } s = 40 \text{ m}$$

$$a = 0.0625 \times 40 \\ = 2.5 \text{ m/s}^2$$

a-s



6 $v = \frac{ds}{dt}$, $ds = v dt$ where $v = 30t$
 $t = 0 - 5s$

$$ds = 30t dt$$

Integrating

$$\int ds = \int 30t dt$$

$$s = \frac{30t^2}{2} = 15t^2$$

when $t = 5s$

$$15 \times 5^2 = 375m$$

$$s = 15s$$

$$v = (-15t + 225) m/s$$

$$ds = (-15t + 225) dt$$

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

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

$$s - 375 = -\frac{15}{2}t^2 + 225t - 937.5$$

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

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

where $t = 15$

$$s = 1125m$$

where $t = 0-15$ using an interval of 3

t	0	3	6	9	12	15
s	0	135	540	855	1057.5	1125

