

INYANG BASSETT 190

181ENG051022

MECHATRONICS ENG

ENG MECHANICS

① Fig 12-11

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

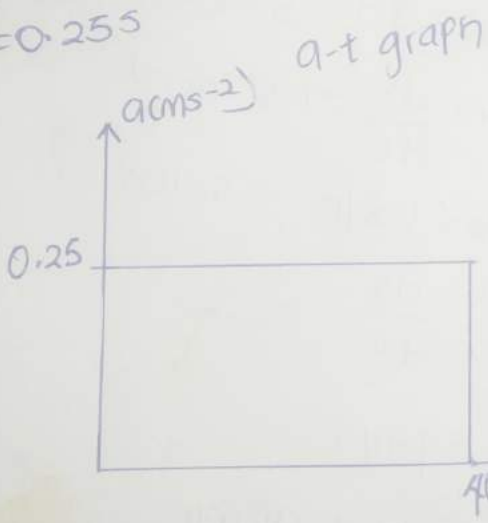
$$v = 0.25s$$

constructing a-s from v-t graph

~~0 < t < 20~~

$$0 < t < 20$$

$$a = 0.25s$$



③ 12-13

construct v-t graph

$$0 \leq t \leq t'$$

t' = time taken by car

v-t graph

$$v = 0$$

$$t = 0$$

$$0 \leq t < 5; a = 20 \text{ m/s}^2$$

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

$$\text{When } t = 5 \text{ s, } v = 20(5) = 100 \text{ m/s}$$

$$5 \text{ s} < t \leq t'; a = -10 \text{ m/s}^2$$

$$\int_{100 \text{ m/s}}^v dv = \int_5^t -10 dt$$

$$v = -10t + 150 \text{ m/s}$$

$$0 = -2t + 30$$

$$2t = 30$$

$$t = 15 \text{ s}$$

$$v = 0$$
$$0 = 10t' + 150$$
$$10t' = 150$$
$$t' = 15 \text{ s}$$

④ 12-14

$$0 \leq t \leq 5 \text{ s};$$

$$v = 150 \text{ m/s}$$

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

$$s = (15t^2) \text{ m}$$

$$\text{When } t = 5 \text{ s}$$

$$s = 15(5)^2 = 375 \text{ m}$$

$$5s \leq t \leq 15s; \frac{ds}{dt} = (-16)t =$$

$$\int_5^{15} 376 dt$$

$$5 - 376 = 15t$$

$$5 = 15t + 376$$

$$S = 15(15) + 373$$

$$S = 600m$$

⑤ ~~12-9~~ 12-12

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

$$V = \frac{ds}{dt} = (6t) \text{ ft/s}$$

V-t graph

$$5 \leq t < 10$$

$$s = (30t - 75)$$

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

$$V = \frac{\Delta s}{\Delta t} = \frac{225 - 75}{10s - 5s}$$

$$V = \frac{150}{5} = 30 \text{ ft/s}$$

continuation of 12-11

a-t graph

$$0 \leq t < 5$$

$$0 \leq t < 5$$

$$V = 30 \text{ ft/s}$$

$$V = (6t) \text{ ft/s} \quad a = \frac{dV}{dt} = 6 \text{ ft/s}^2$$

$$5 \leq t < 10$$

$$V = 30 \text{ ft/s} \quad a = \frac{dV}{dt} = 0$$

F 12-9

$$V = \frac{ds}{dt} \quad V_0 = \frac{ds}{dt} = 1.5t^2$$

$$0 \leq t < 6s, \quad s = 0.5t^3$$

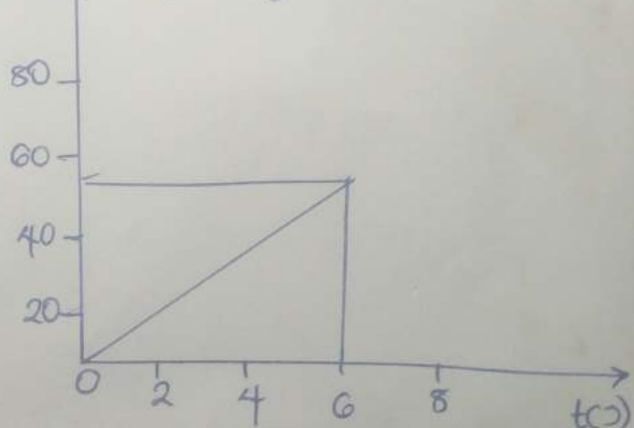
$$\therefore V = \frac{ds}{dt} = 1.5t^2 \text{ ms}^{-1}$$

$$6 < t \leq 10; \quad s = 108$$

$$V = \frac{ds}{dt} = 0$$

$$V = 54 \text{ m/s}$$

v-t graph



12-10

$$v = -4t + 180 \text{ (for } v-t \text{ graph)}$$

$$s = \int -4t + 180$$
$$= -\frac{4t^2}{2} + 180t$$
$$= -2t^2 + 180t$$

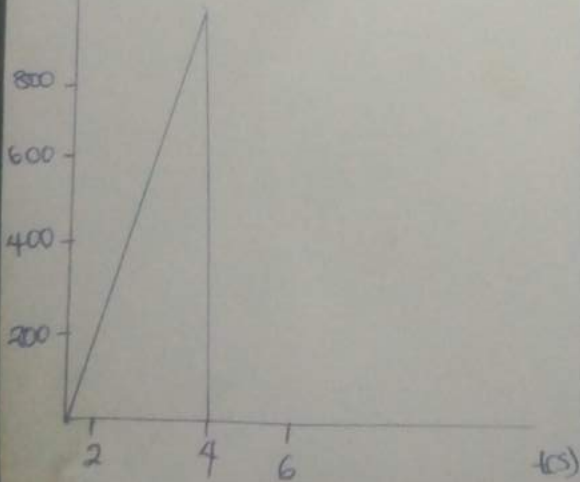
$$s = -2(20)^2 + 180(20)$$

$$s = -800 + 3600$$
$$s = 2800 \text{ m}$$

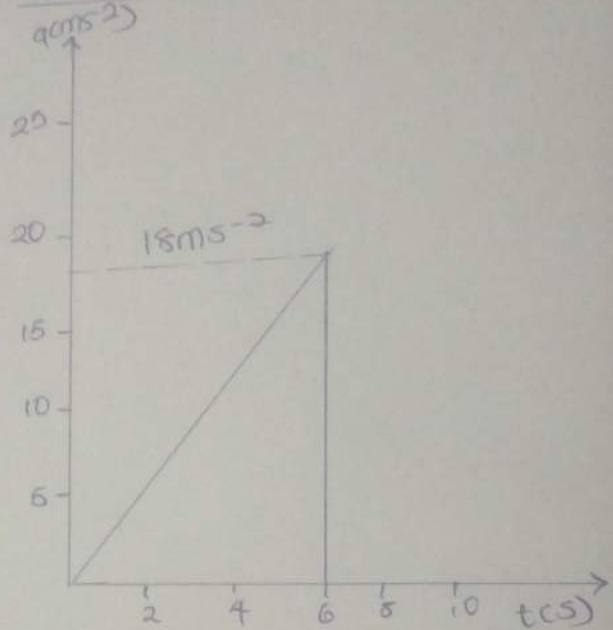
For $a-t$ graph

$$a = \frac{dv}{dt}$$
$$= -4 \text{ m/s}^2$$

50 m/s

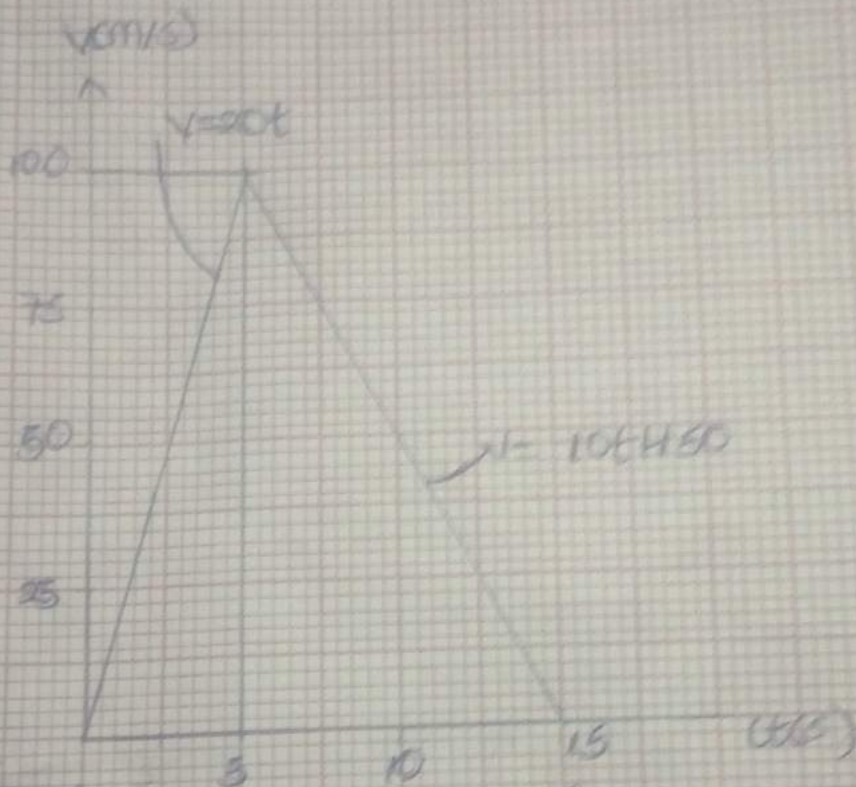


Continuation of 12-9

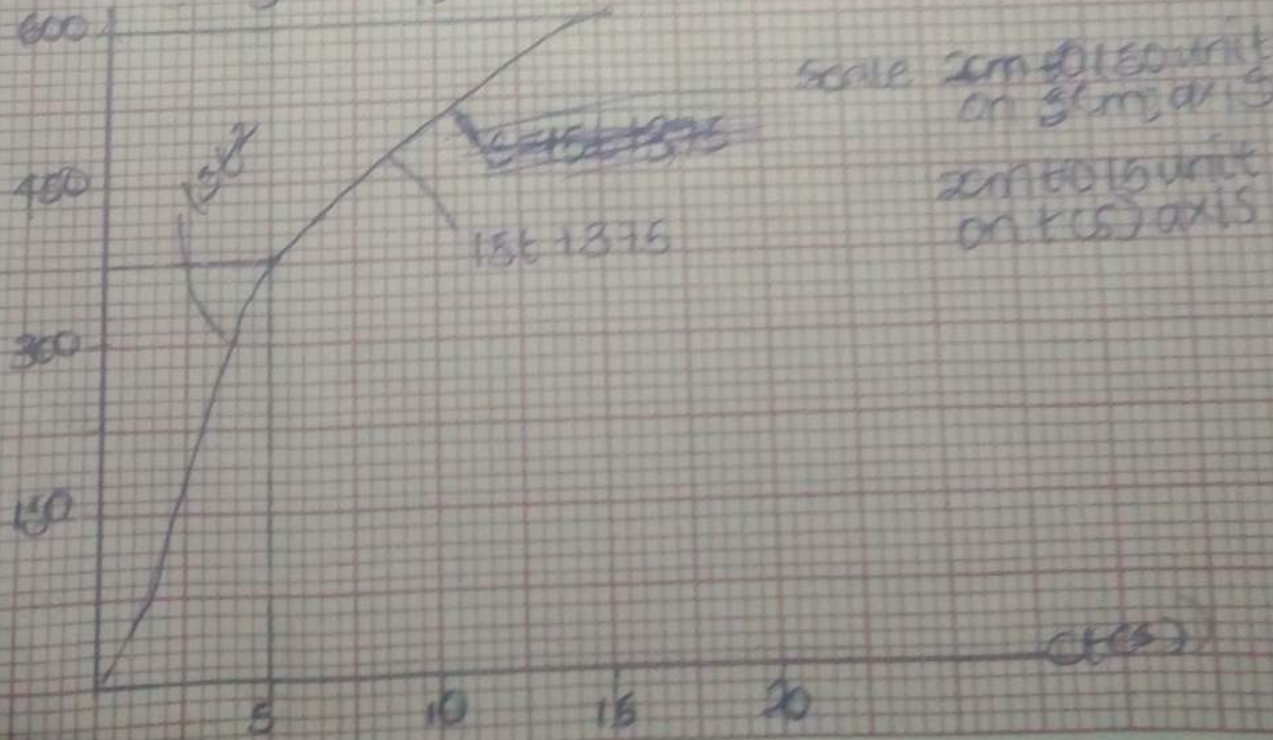


Graph 12-3

A graph v against t
 Scale: 2cm to 20 units on v
 2cm to 5 units on t



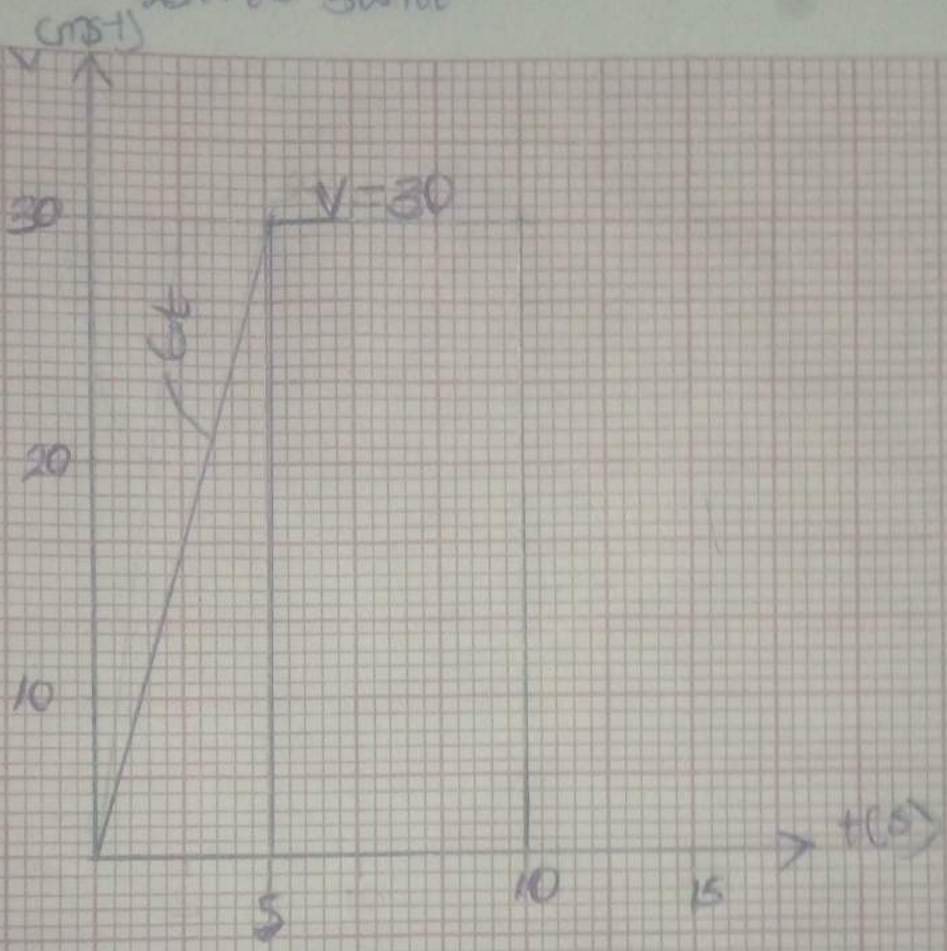
GRAPH 12-4



GRAPH 12-4

Scale: 2cm to 10 unit
2cm to 5 unit

12-12
V-t graph



Scale: 2cm to 2 unit on s axis
2cm to 3 unit on t axis

12-12
s-t graph

