

Ologunagba Bright | Zuluwalope

18/ENG04/052

Electrical Engineering
Mechanics

① F12-9.

$$t = 6 - 0.1t^3$$

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

$$s = 0.1t^3$$

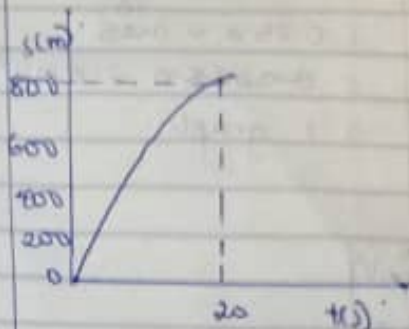
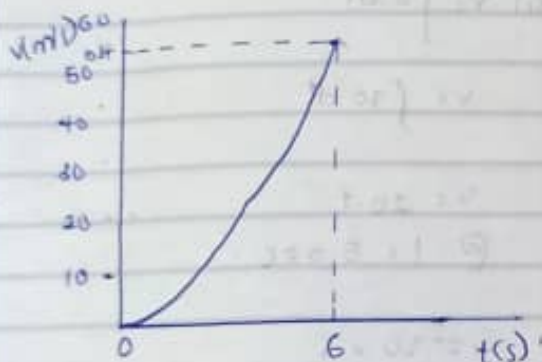
$$v = \frac{ds}{dt}$$

$$v = 1.5t^2$$

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

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

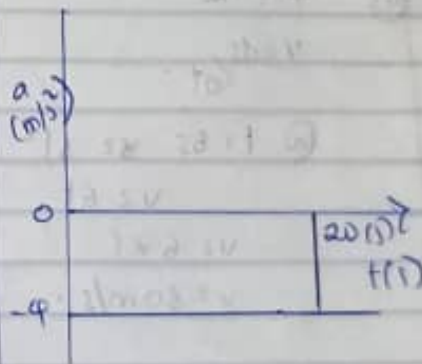
v-t graph



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

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

a-t graph



② F12-10.

$$s = 20 + t^2$$

$$t = 20 \quad v = 80 \text{ m/s}$$

$$v = -4t + 80$$

$$s = \int v \cdot dt$$

$$s = \int (-4t + 80) \cdot dt$$

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

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

$$s = 800 \text{ m}$$

⑤ F12-11

$$v = 0.25s \quad \frac{dv}{ds} = 0.25$$

$$s = 40 \text{ m} \quad v = 10 \text{ m/s}$$

$$a = \left(\frac{dv}{ds}\right)v$$

$$v = ds \frac{dv}{ds} \quad a = \frac{dv}{dt}$$

$$v \cdot dt = ds \quad a \cdot dt = dv$$

$$dt = \frac{ds}{v} \quad dt = \frac{dv}{a}$$

$$\frac{ds}{v} = \frac{dv}{a}$$

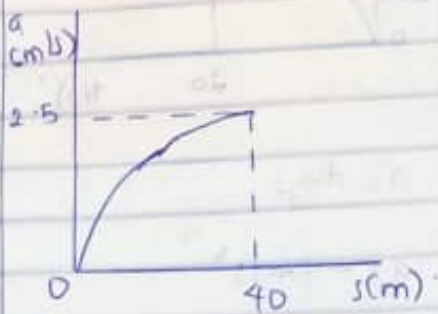
$$a = \left(\frac{dv}{ds}\right)v$$

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

$$= 0.25 \times 10 \times 2.5$$

$$= 2.5 \text{ m/s}^2$$

a-s graph:



(9) F12-12

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

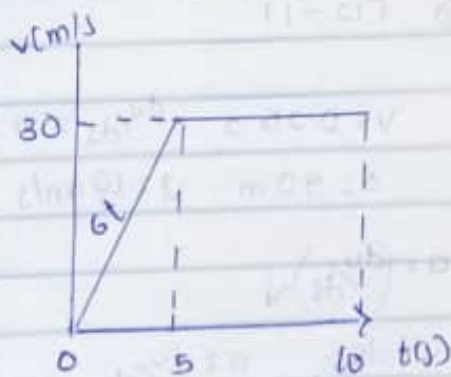
$$\text{a) } t = 5 \text{ s } \quad v = 3t^2$$

$$v = 6t$$

$$v = 6 \times 5$$

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

v-t graph:



(11) $a = \frac{dv}{dt}$

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

$$a = 6 \text{ m/s}^2$$

$$\text{@ } t = 10 \text{ s}$$

$$a = 0 \text{ m/s}^2$$



(5) $t \in 0-5 \text{ s}$
 $a = 20 \text{ m/s}^2$

(i) $v = \int a \cdot dt$

$$v = \int 20 \cdot dt$$

$$v = 20t$$

$$\text{@ } t = 5 \text{ sec}$$

$$v = 20 \times 5$$

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

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

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

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

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

$$\text{@ } t' \quad v = 0$$

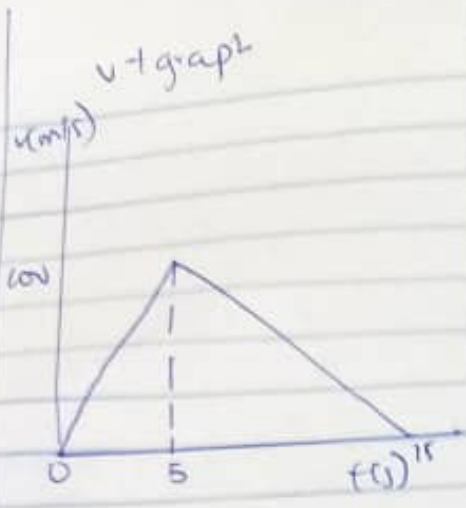
$$0 - 100 = -10t' + 50$$

$$10t' = 150$$

$$t' = 15 \text{ s}$$

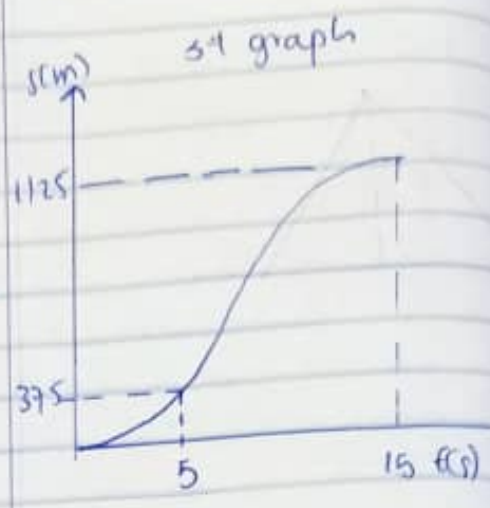
v-t graph:





$$s - 375 = 750$$

$$s = 1125 \text{ m}$$



v-t graph

⑥ $v = 150 \text{ m/s}$
 $v = 30t$
 $s = \int v \cdot dt$
 $s = \int 30 \cdot t \cdot dt$
 $s = \frac{30t^2}{2}$
 $= 15t^2 \Big|_0^5$

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

$$s = 375 \text{ m}$$

$$v = -15t + 225$$

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

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

$$s - 375 = \frac{-15(15)^2 + 225(15)}{2}$$

$$- \left(\frac{-15(5)^2 + 225(5)}{2} \right)$$

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

$$- (187.5 + 1125)$$