

1) An electronic power supply requires 25 W of input power. It can produce an output power of 20 W. Calculate the efficiency and the power loss.

Soln:

Input power = 25 W

Output power = 20 W

$$\eta = \frac{\text{Power output}}{\text{Power input}} = \frac{20}{25} = 0.8$$

$$\% \eta = 80\%$$

$$\text{Power loss} = \text{Input power} - \text{output power}$$

$$= 25 - 20$$

$$\text{Power loss} = 5 \text{ W}$$

2) A solar Yard light has a solar collector that can provide 1W of Power for charging the 3V battery. What is the maximum charging current the solar collector would supply to the fully discharged 3V battery.

Soln.

$$\text{Power} = 1\text{W}$$

$$\text{Voltage} = 3\text{V}$$

We know that

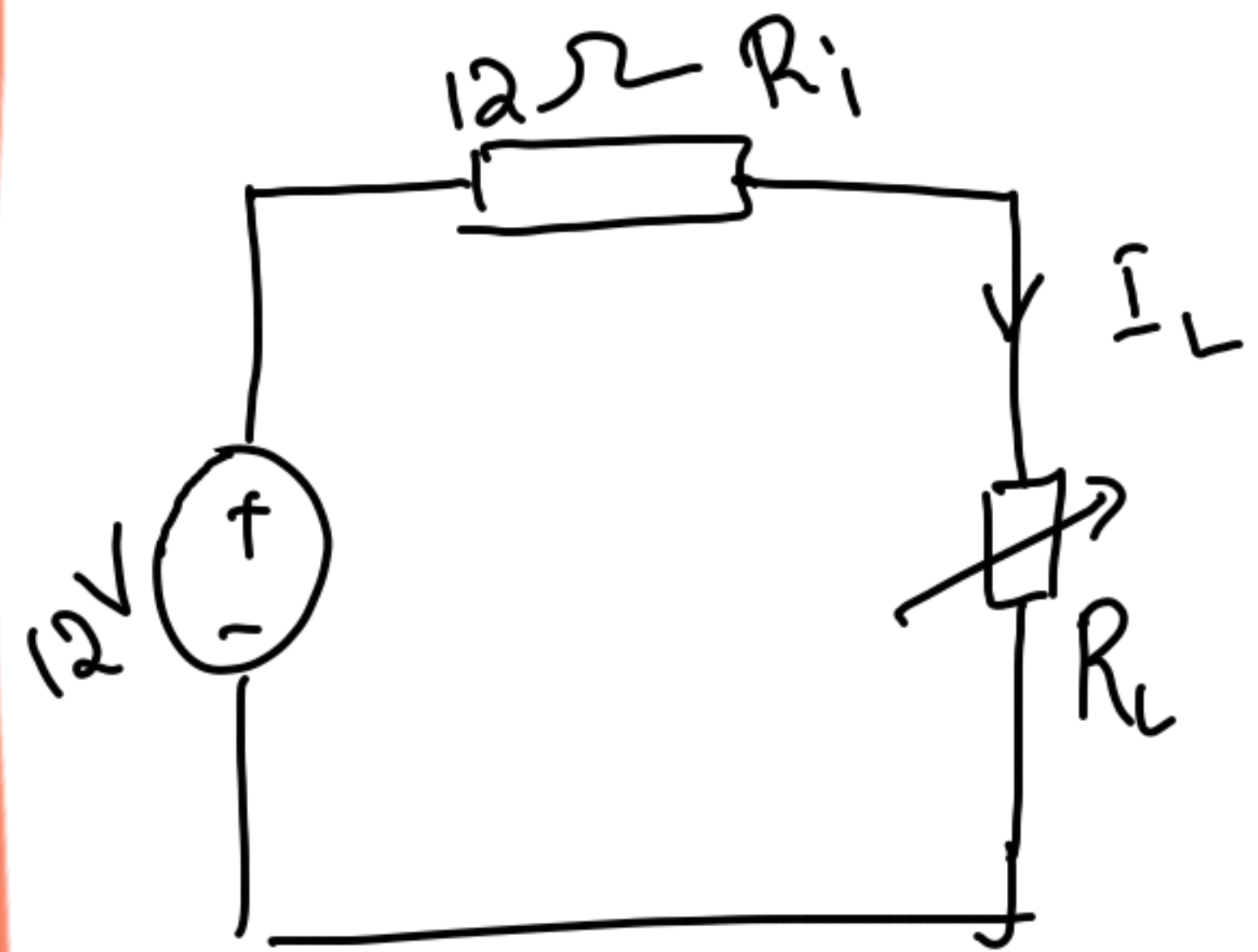
$$P = VI$$

$$I = \frac{P}{V} = \frac{1}{3}$$

$$I = 0.33\text{A}$$

3) A 12V Voltage source Source has an internal Resistance of 12Ω . Calculate the power dissipated by the load resistor for the values given in the table below and plot a graph.

$R_L (\Omega)$	$P_L (W)$
4	
8	
12	
16	
20	



$$P_L = I_L^2 R_L$$

$$I_L = \frac{V}{R_i + R_L}$$

When,

$$R_L = 4 \Omega$$

$$I_L = \frac{12}{12+4} = 0.75 \text{ A}$$

$$P_L = (0.75)^2 \times 4$$

$$P_L = 2.25 \text{ W}$$

When, $R_L = 8 \Omega$

$$I_L = \frac{12}{12+8} = 0.6 \text{ A}$$

$$P_L = (0.6)^2 \times 8$$

$$P_L = 2.88 \text{ W}$$

When $R_L = 12 \Omega$.

$$I_L = \frac{12}{12+12} = 0.5$$

$$P_L = (0.5)^2 \times 12$$

$$P_L = 3 \text{ W}$$

When $R_L = 16 \Omega$

$$I_L = \frac{12}{12+16} = 0.43$$

$$P_L = (0.43)^2 \times 16$$

$$P_L = 2.96 \text{ W}$$

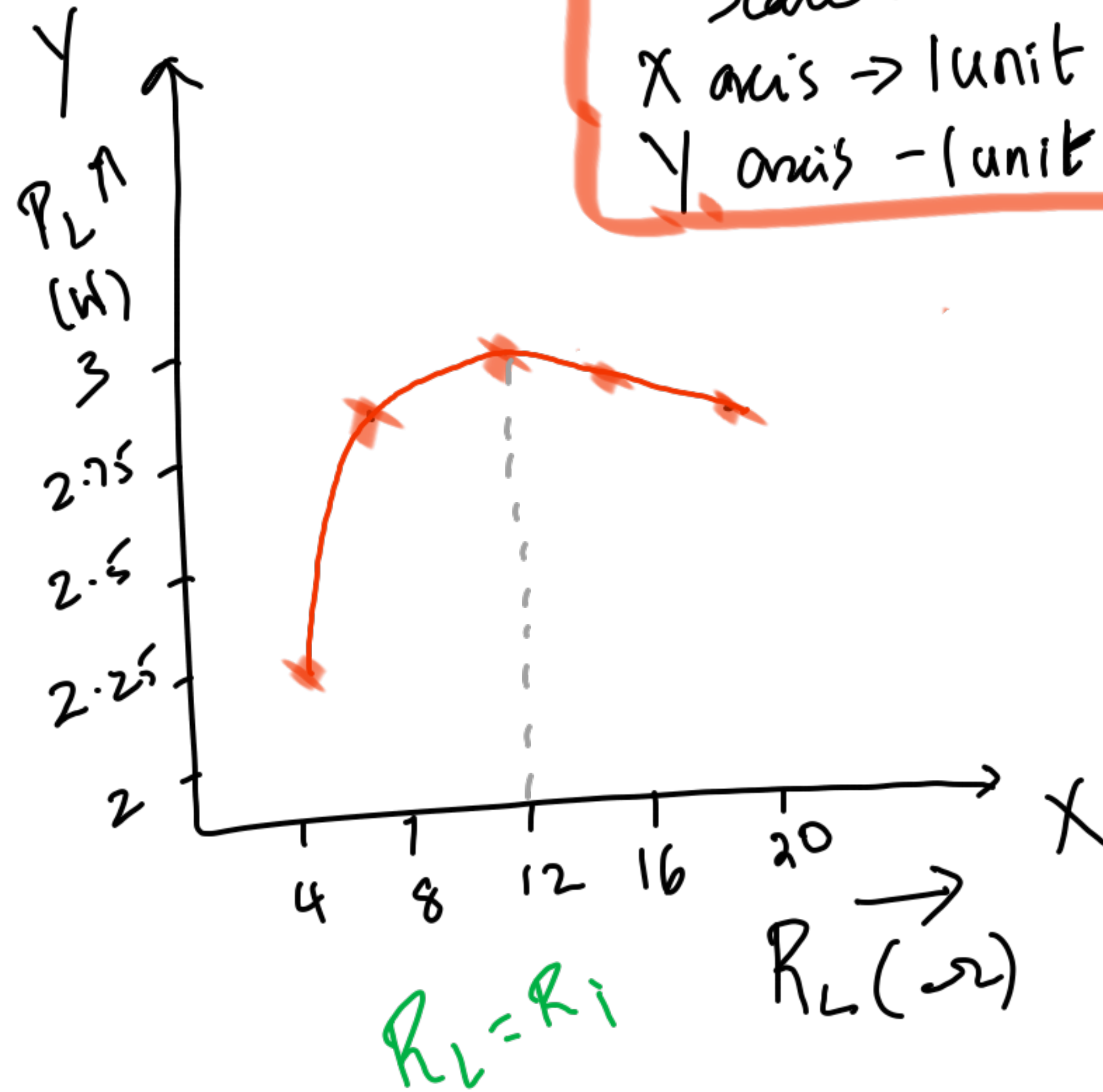
When $R_L = 20 \Omega$

$$I_L = \frac{12}{12+20} = 0.38$$

$$P_L = (0.38)^2 \times 20$$

$$P_L = 2.8 \text{ W}$$

$R_L (\Omega)$	$P_L (W)$
4	2.25
8	2.88
12	3
16	2.96
20	2.8



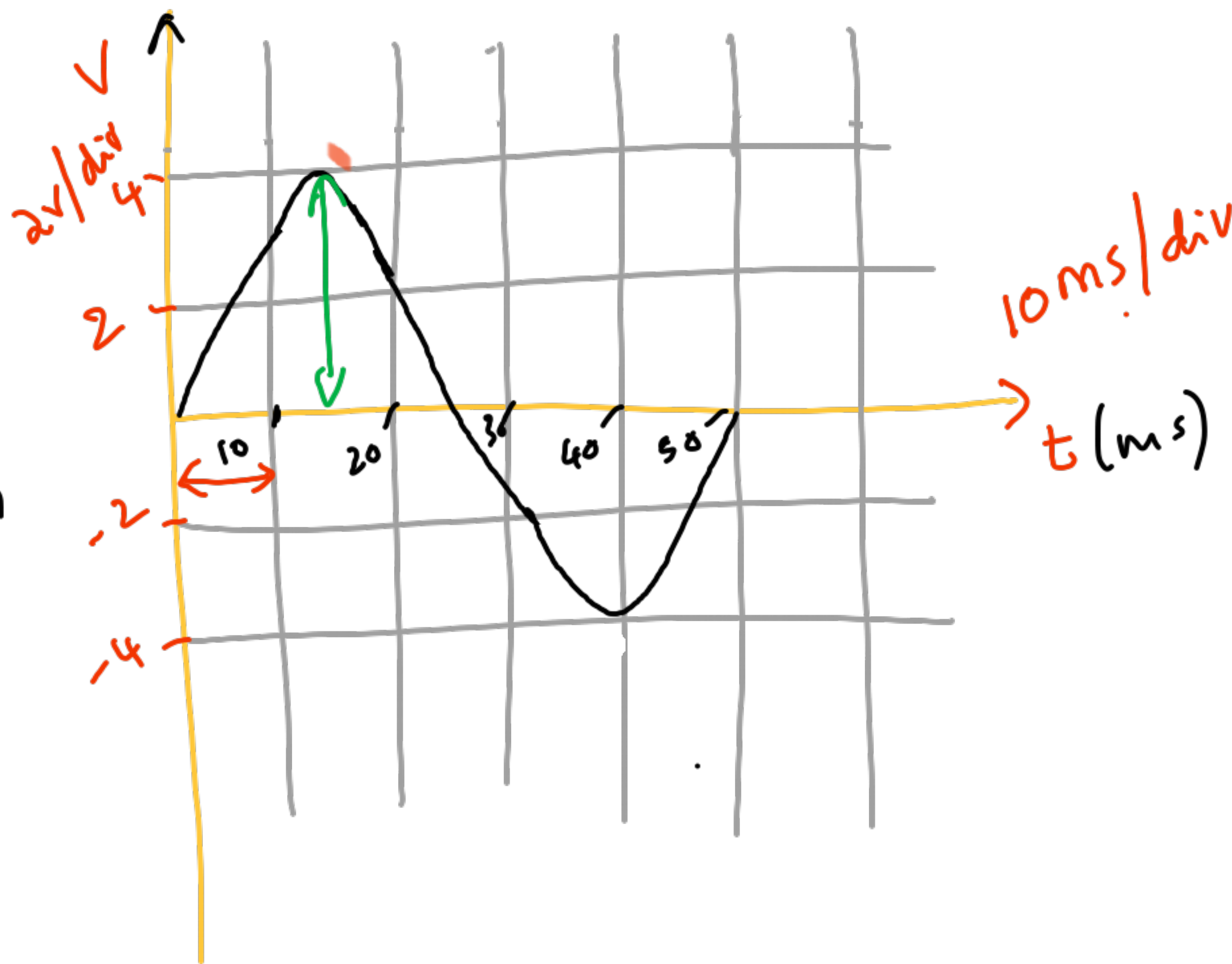
Scale:

X axis $\rightarrow$ 1 unit $= 4 \Omega$

Y axis $\rightarrow$ 1 unit $= 0.25 W$

4) A sine wave observed in oscilloscope as shown in figure. The time setting is 10ms/div and Voltage is 2V/div . Estimate the following

- Peak voltage
- Peak to peak voltage
- Time period of waveform
- Frequency.



a) Peak value

$$V_m = 4V$$

b) Peak to peak value

$$V_{pp} = V_m \times 2$$

$$= 4 \times 2$$

$$V_{pp} = 8V$$

c) Time period

$$T = 50ms$$

d) frequency.

$$f = \frac{1}{T} = \frac{1}{50 \times 10^{-3}}$$

$$f = 20Hz$$

5) An alternating voltage is given by

$$V = 75 \sin(200\pi t - 0.25) \text{ volts.}$$

Calculate

- a) Amplitude
- b) Peak to peak value
- c) RMS value
- d) Periodic time
- e) frequency.

Soln,

$$V = 75 \sin(\underline{200\pi t} - 0.25) \text{ volts}$$

Similar to

$$V = V_m \sin(\omega t - \phi)$$

$$V_m = 75$$

$$\omega = 200\pi$$

$$\phi = 0.25$$

a) Amplitude.

$$V_m = 75 \text{ V}$$

b) Peak to peak Voltage

$$V_{pp} = 2 \times V_m$$
$$= 2 \times 75$$

$$V_{pp} = 150 \text{ V}$$

c) RMS Value.

$$V_{RMS} = \frac{V_m}{\sqrt{2}} = \frac{75}{\sqrt{2}}$$

$$V_{RMS} = 53.03 \text{ V}$$

d) Time

$$\omega = 200\pi$$

$$2\pi f = 200\pi$$

$$f = \frac{200\pi}{2\pi}$$

$$f = 100 \text{ Hz.}$$

$$T = \frac{1}{f} = \frac{1}{100} = 0.01 \text{ s}$$

$$T = 10 \text{ ms}$$

e) $f = 100 \text{ Hz.}$

