

1) A lamp requires 330Ω resistor to limit the current flow. The voltage across the current limiting resistor is $3V$. What is the current across the resistor.

$$V = 3V$$

$$R = 330\Omega.$$

$$I = ?$$

$$I = \frac{V}{R}$$

$$I = \frac{3}{330}$$

$$I = 9 \times 10^{-3} A$$

$$I = 9mA$$

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 that the solar collector could supply to fully discharged $3V$ battery.

$$\text{Soln} \quad P = 1W$$

$$V = 3V$$

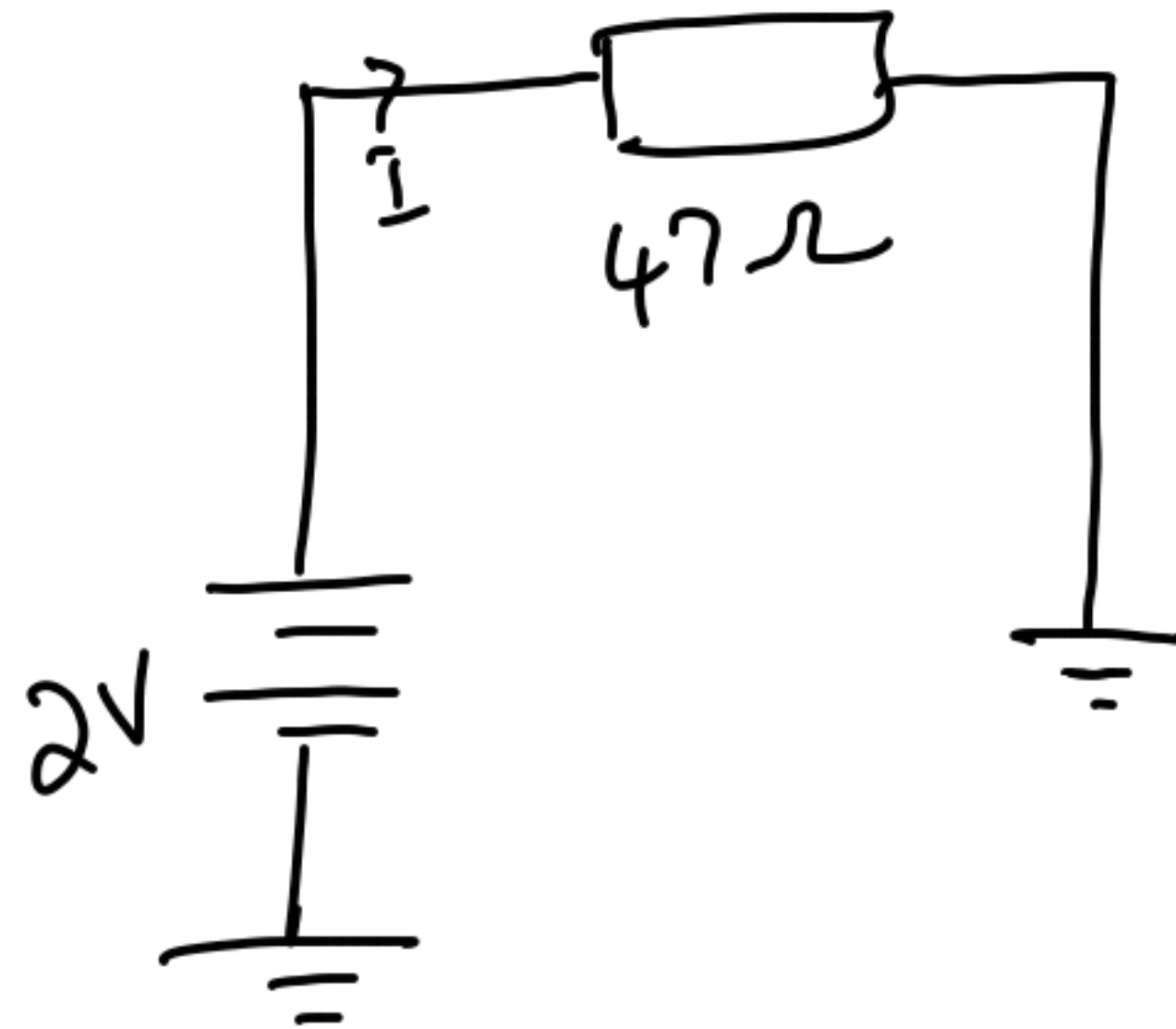
$$P = V I$$

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

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

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

3) Calculate the power in the following circuit



56W

$$V = 2 \text{ V}$$

$$R = 47 \Omega$$

$$P = V I$$

$$I = \frac{V}{R} = \frac{2}{47}$$

$$I = 0.04 \text{ A}$$

$$P = 2 \times 0.04$$

$$P = 0.08 \text{ W}$$

4) 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.

$$P_{in} = 25 \text{ W}$$

$$P_{out} = 20 \text{ W}$$

$$\% \eta = \frac{P_{out}}{P_{in}} = \frac{20}{25} = 80\%$$

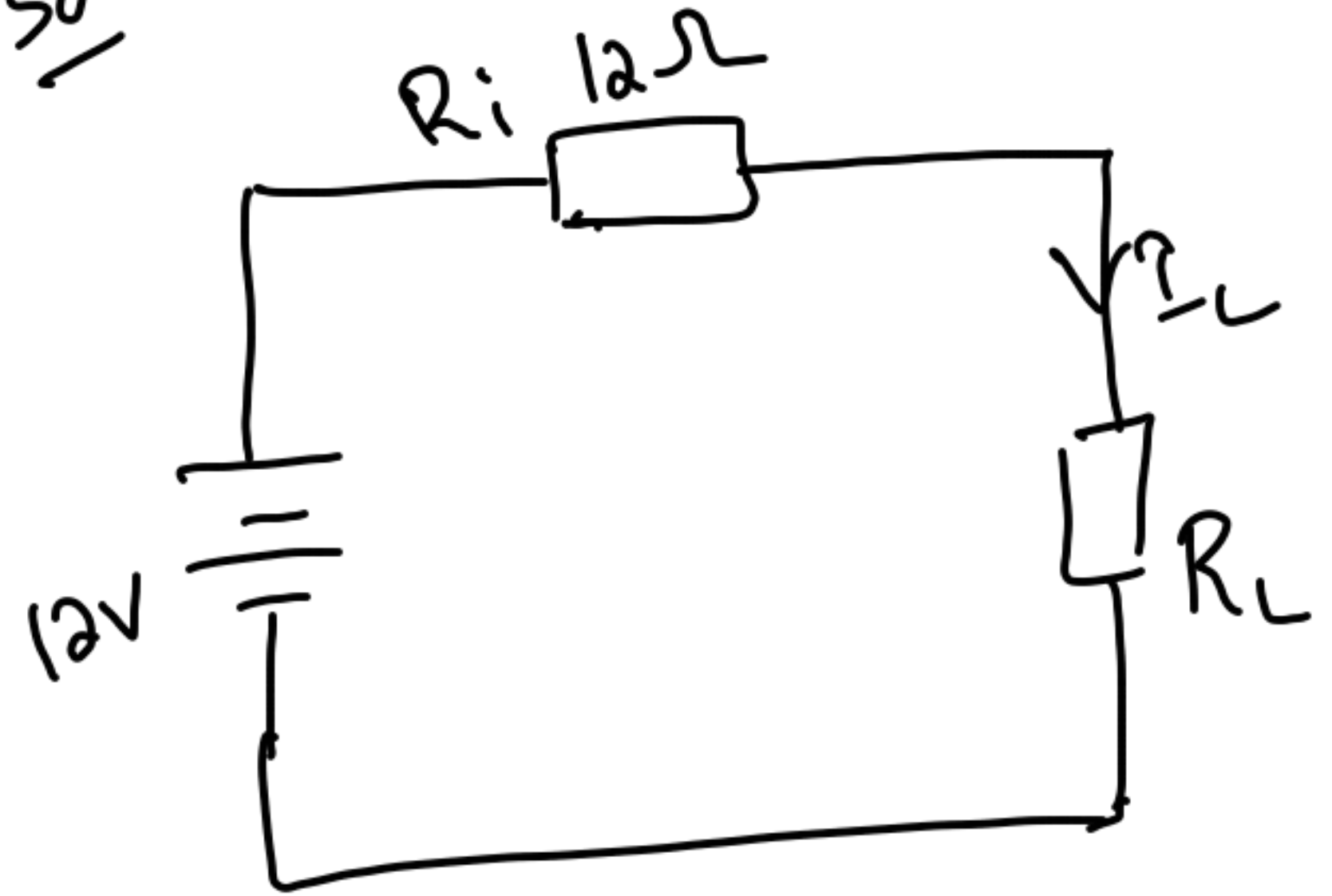
$$\begin{aligned} \text{Power loss} &= P_{in} - P_{out} \\ &= 25 - 20 \end{aligned}$$

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

5) If the voltage source of 12V has a internal resistance of 12Ω . Calculate the power at the load Resistor mentioned in the table below and plot a graph.

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

Soln.



$$I_L = \frac{V}{R_L + R_i} \quad , \quad P_L = I_L^2 R_L$$

When $R_L = 4\Omega$

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

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

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

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 $R_L = 12 \Omega$.

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

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

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

When $R_L = 16 \Omega$

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

$$P_L = (0.43)^2 \times 16 = 2.94 \text{ W}$$

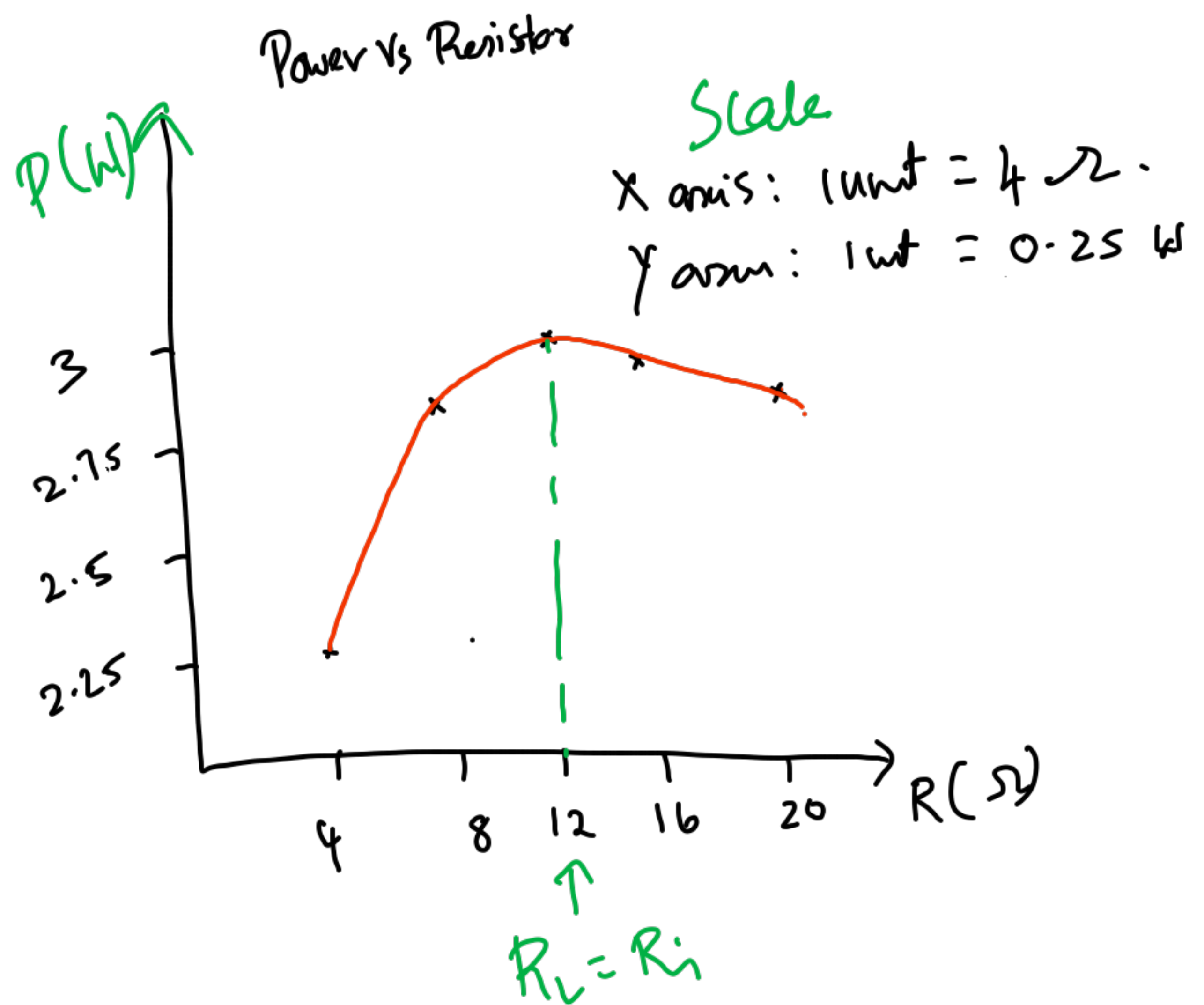
When $R_L = 20 \Omega$

$$I_L = \frac{12}{12+20} = 0.375 \text{ A}$$

$$P_L = (0.375)^2 \times 20$$

$$P_L = 2.81 \text{ W}$$

$R_L (\Omega)$	$P_L (W)$
4	2.25
8	2.88
12	3
16	2.94
20	2.81



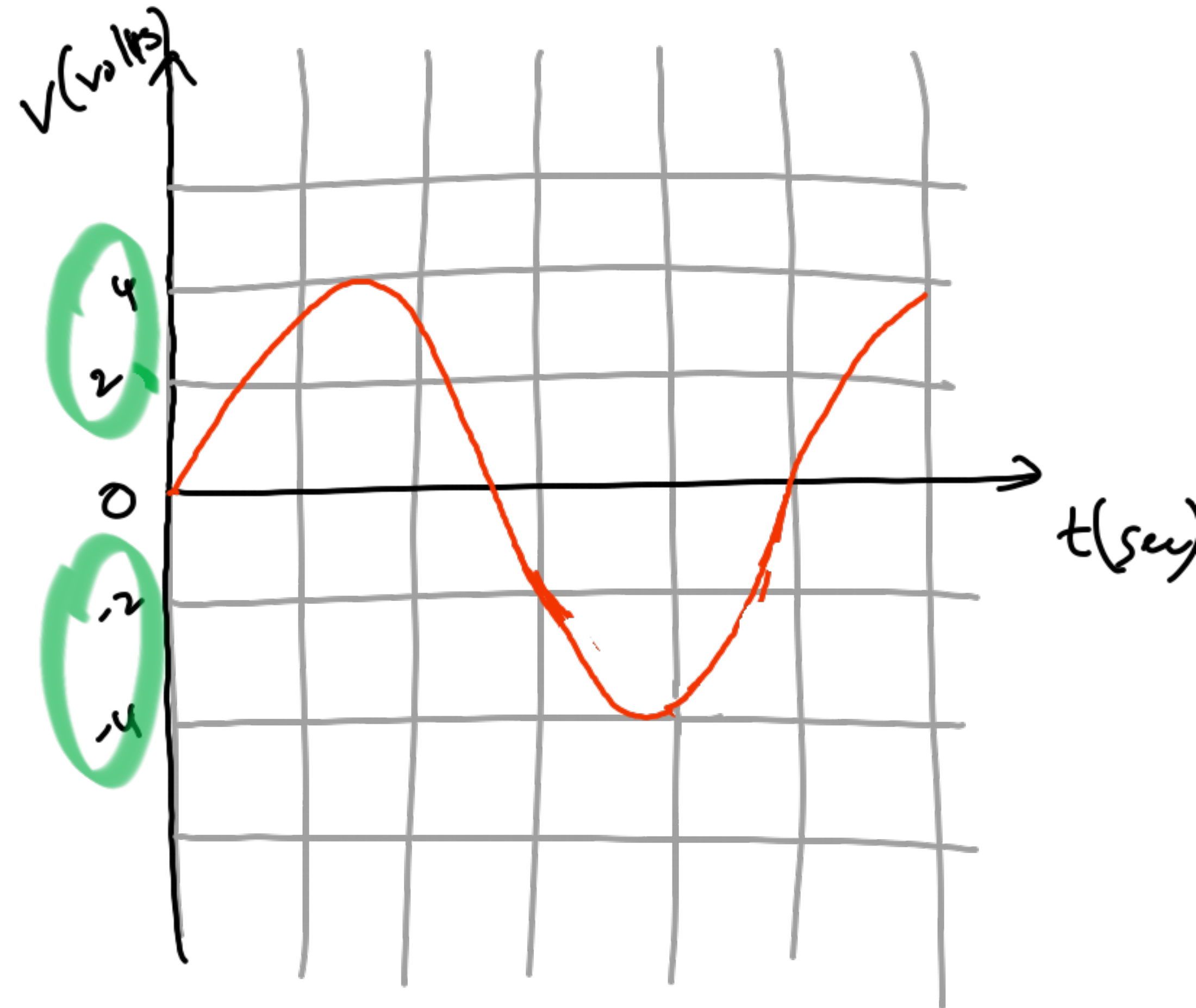
b) A sine wave is observed in an oscilloscope as shown in figure the time setting is 10ms/div and Voltage is 2V/div Calculate the following

a) Peak voltage

b) Peak to peak voltage

c) Time period of the waveform

d) frequency



a) Peak voltage

$$V_p = 4V$$

b) Peak to peak voltage.

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

$$= 2 \times 4$$

$$V_{pp} = 8$$

c) Time period.

$$T = 50ms$$

d) frequency.

$$f = \frac{1}{T} = \frac{1}{5 \times 10^{-3}}$$

$$f = 20 \text{ Hz.}$$

7) An alternating Voltage is given by $v = 75 \sin(200\pi t - 0.25)$ volts.

Calculate

- Amplitude
- Peak to peak value
- RMS value
- Time period
- frequency.

Soln

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

we. know that

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

Comparing both equation.

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

$$\omega = 200\pi$$

$$\phi = 0.25$$

a) Amplitude

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

b) Peak to peak value.

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

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

c) RMS value.

$$V_{RMS} = \frac{V_m}{\sqrt{2}} = \frac{75}{\sqrt{2}} = 53.03$$

d) Time period.

$$\omega = 200\pi$$

We know that, $\omega = 2\pi f$

$$\text{Sub. } \omega = 2\pi f$$

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

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

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

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

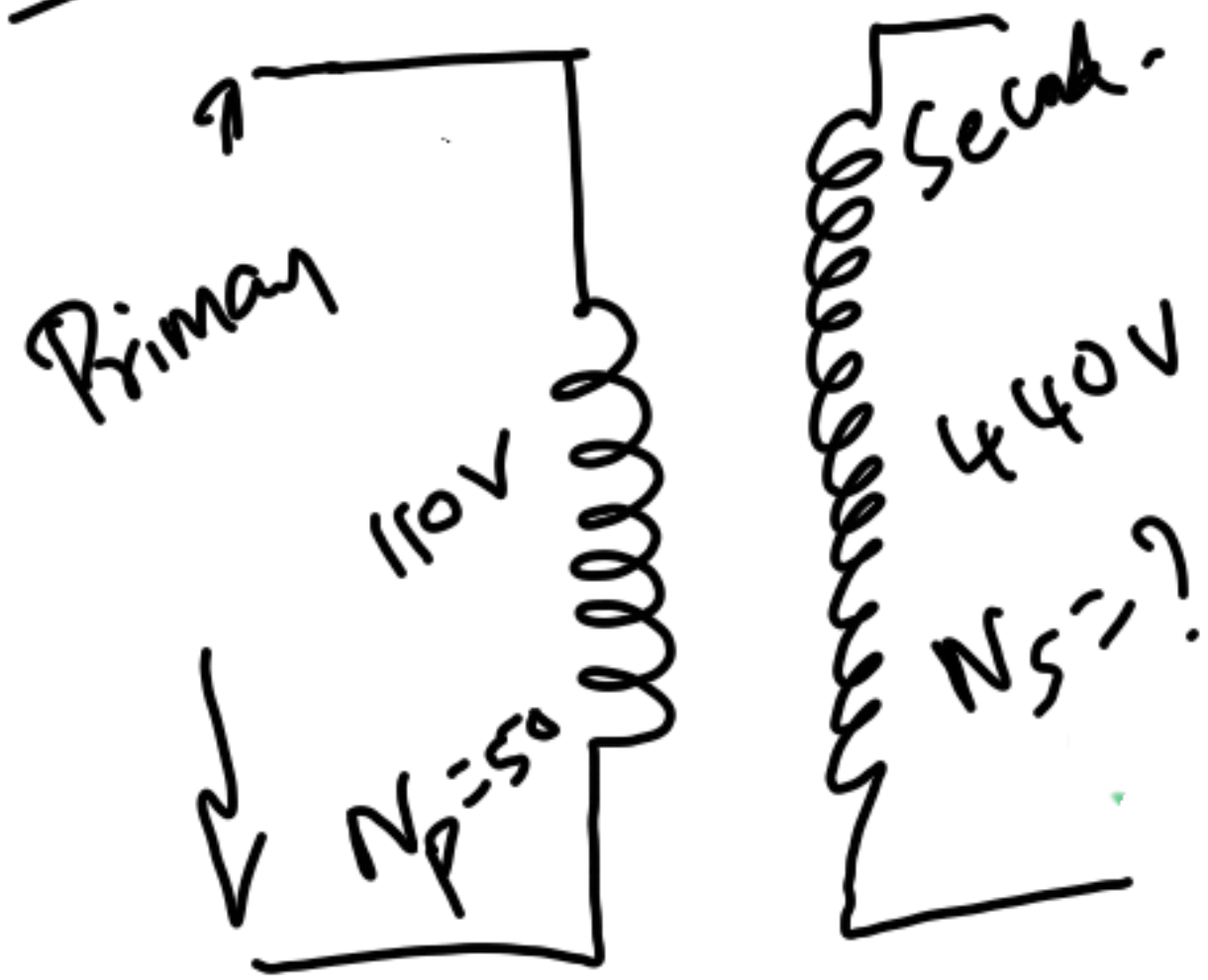
$$T = 10 \text{ ms}$$

e) frequency:

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

8) A transformer Steps-up voltage from 110V to 440V. If the primary coil has 50 turns. How many turns does the Secondary coil has.

Soln.



Given.

$$V_p = 110V$$

$$V_s = 440V$$

$$N_p = 50$$

$$N_s = ?$$

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

$$N_s = N_p \frac{V_s}{V_p}$$

$$N_s = 50 \times \frac{440}{110}$$

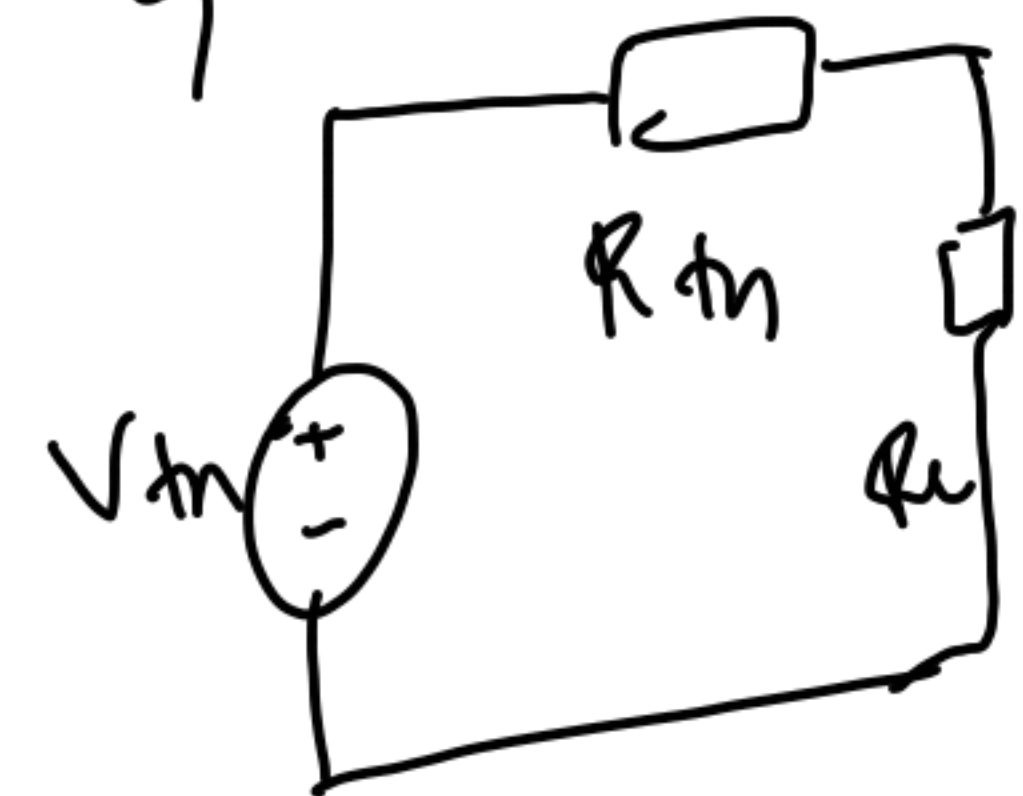
$$N_s = 200 \text{ turns}$$

Thevenins Theorem

→ Active & passive devices in ckt can be replaced by Voltage source & Series Resistor.

$V \rightarrow V_{\text{open circuit}} \rightarrow V_{th}$
(open cirt $\rightarrow R_L$)

$R_{eq} \rightarrow R_{th} \rightarrow \text{equivalent resistor.}$

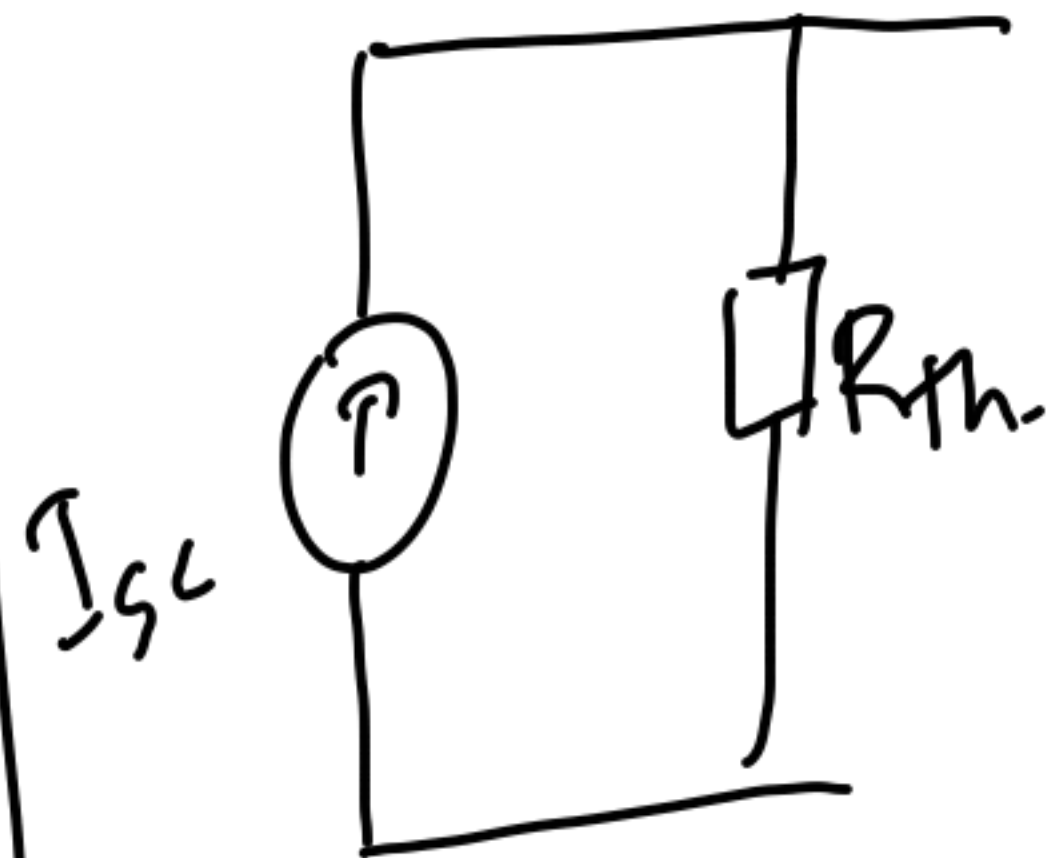


$$I_L = \frac{V_{th}}{R_{th} + R_L}$$

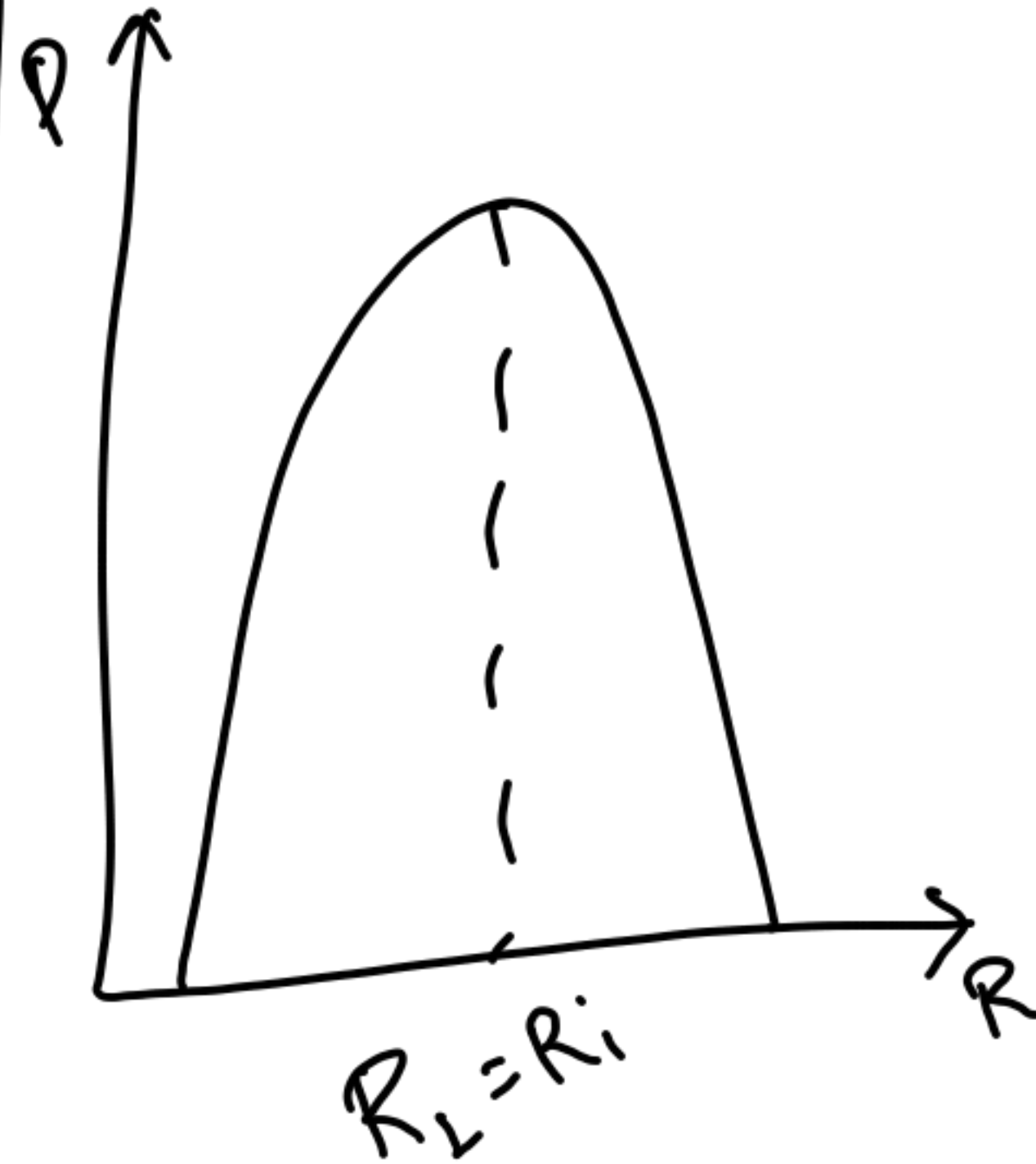
Nortons theorem

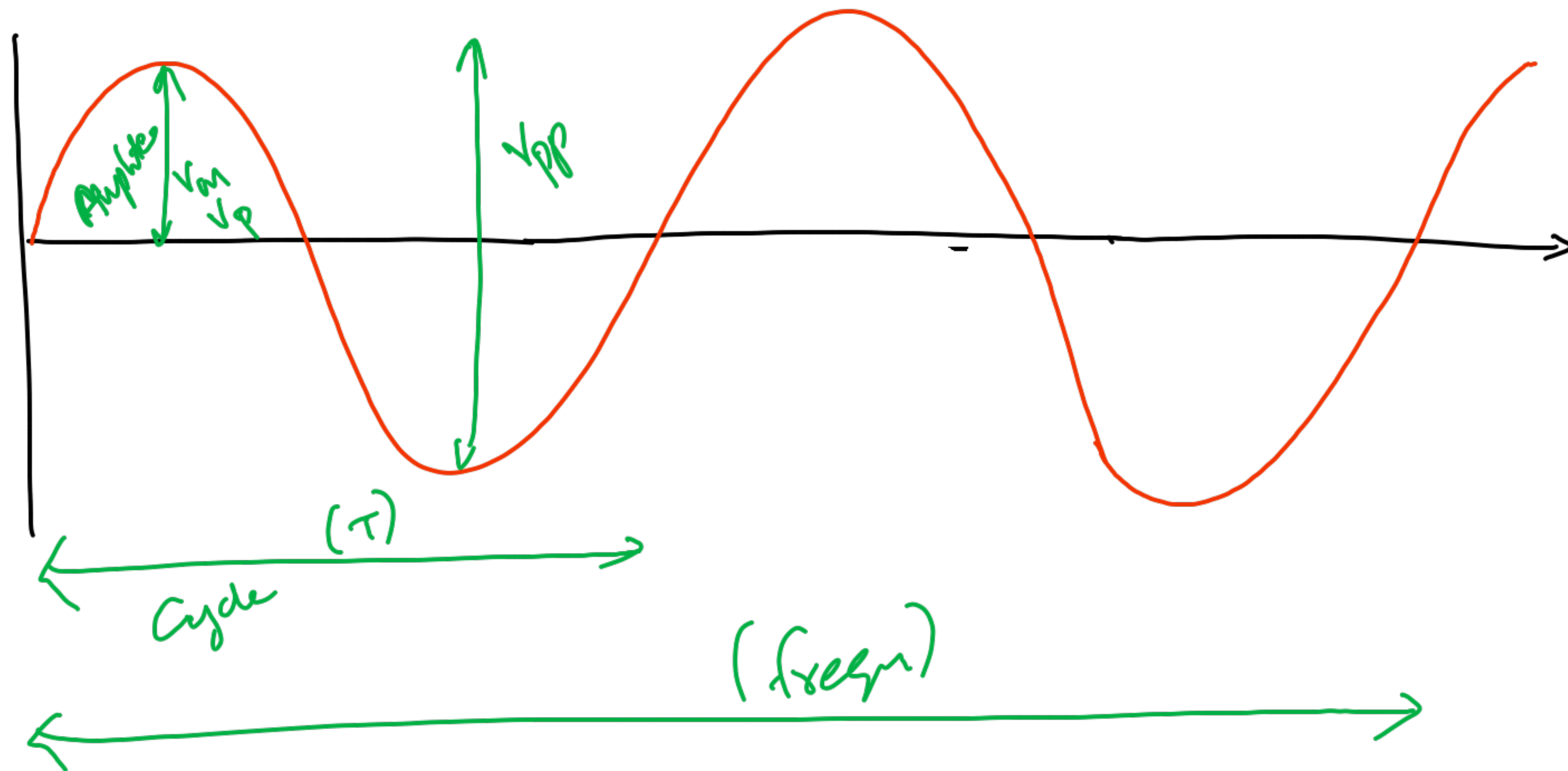
→ Active & passive dev.
→ replaced by equivalent current source & parallel equivalent resit

→ $I \rightarrow I_{sc} \rightarrow \text{along } (R_L)$



Maximal power x. thm





$$\omega = 2\pi f$$

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

$$f = \frac{1}{T} \quad 1 \text{ sec}$$

