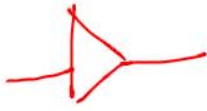


# Superposition:

✓ linear circuits

buffer digital electronics



not not

$$V = iR$$

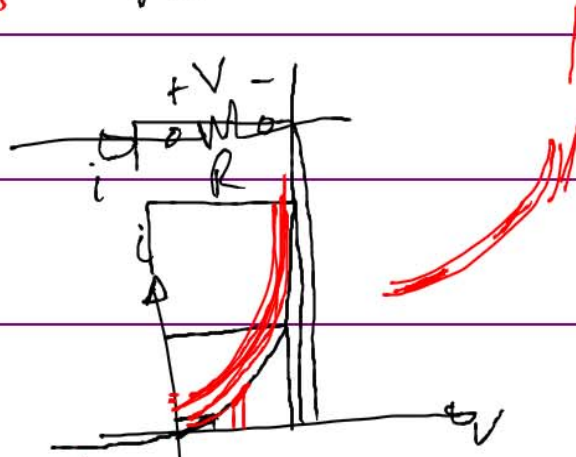
diode



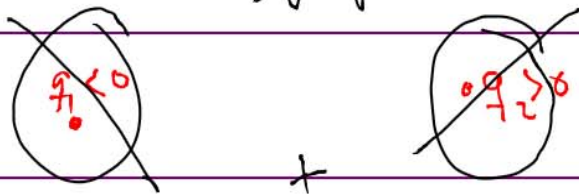
non-linear

approximation  $\sim$

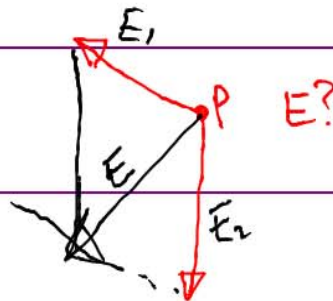
linear for small signals



superposition



Superposition



$$V_1$$

$$|V_1|^2$$

$$V_2$$

$$|V_2|^2$$

$$|V_1 + V_2|^2$$

$$|V_1 + V_2|^2$$

$$\psi_1 + \psi_2$$

$$|\psi_1 + \psi_2|^2$$

$$\underbrace{(|\psi_1|^2)}_X + \underbrace{(|\psi_2|^2)}_X \neq |\psi_1 + \psi_2|^2$$

$$F_1 \rightarrow X_1^2$$

$$F_2 \rightarrow X_2^2$$

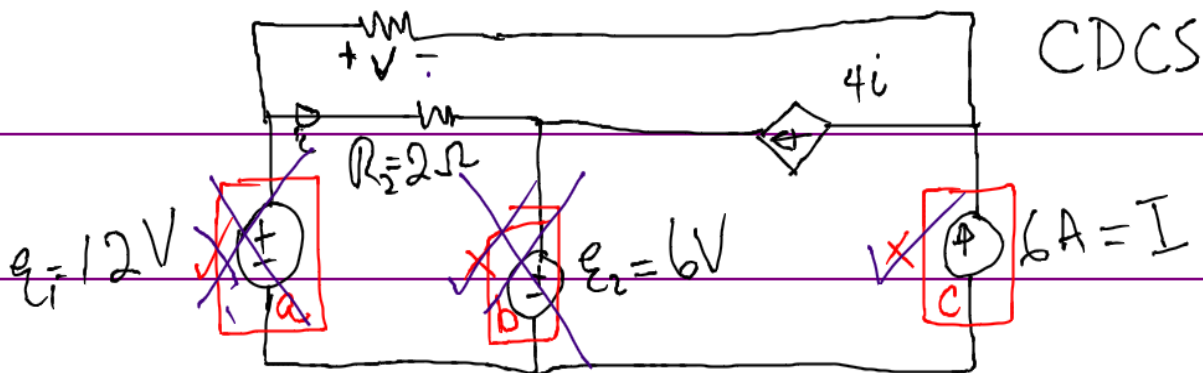
non-linear

$$F_1 + F_2 \quad (X_1 + X_2)^2$$

we can NOT apply superposition

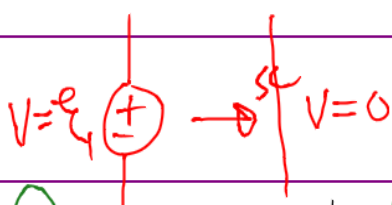
$$X_1^2 + X_2^2 \neq (X_1 + X_2)^2$$

$$R_1 = 5\Omega$$



$i = ?$   
 $V = ?$   
 KCL, KVL Y- $\nabla$

Solve by superposition



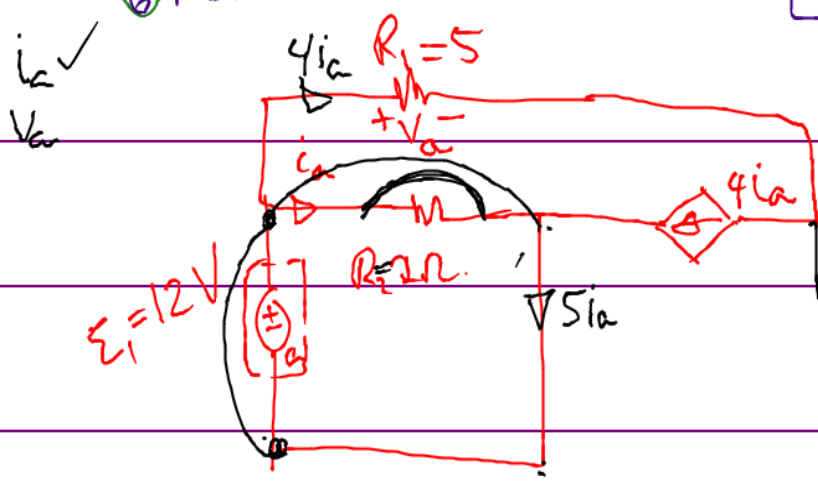
$$i = i_a + i_b + i_c$$

$$V = V_a + V_b + V_c$$

$120 + 120 - 60 - 30$

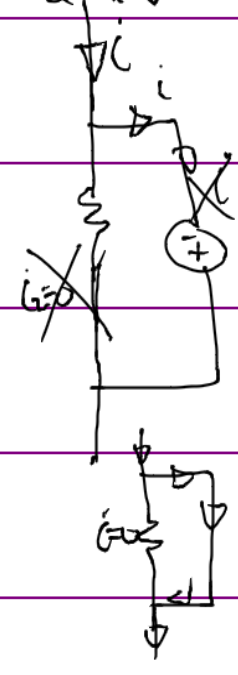
$$i = 3A$$

$$V = 30 \text{ volt}$$



$$V_a = 20 i_a$$

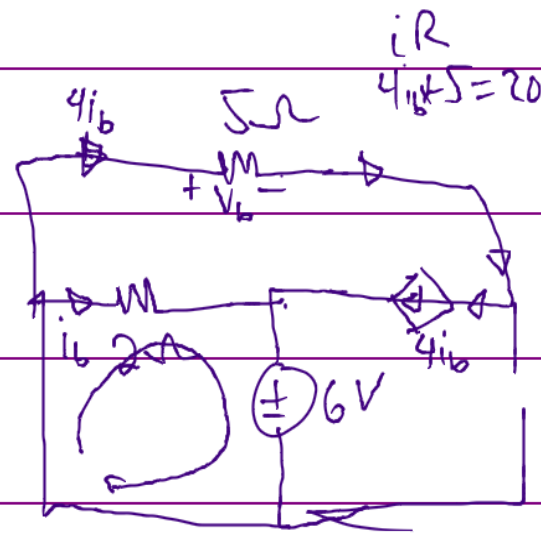
$$= 20 \times 6 = 120V$$



$$2 \times i_a = 12 \Rightarrow i_a = 6$$

KVL:  $+12 - 2 \times i_a + 0 + 0 = 0$

$$i_a = 6 \text{ A}$$



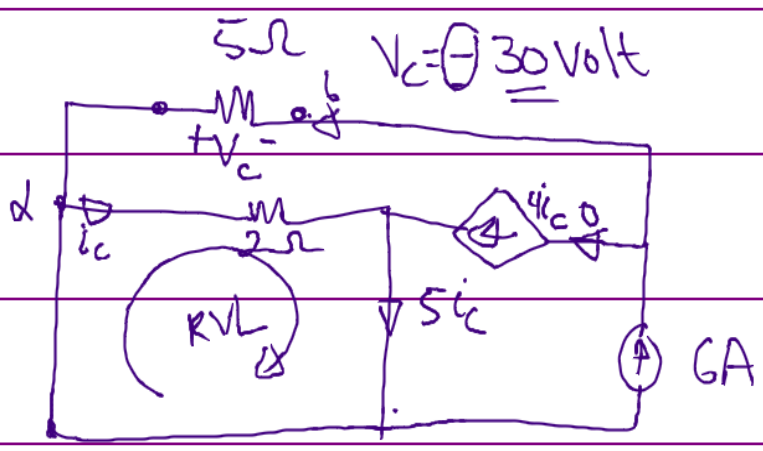
$$V_b = 20 i_b$$

$$V_b = -60V$$

$$-2 i_b - 6 = 0$$

$$i_b = -3A$$

$$V = iR$$



$$0 - 2 i_c + 0 + 0 = 0 \Rightarrow i_c = 0$$