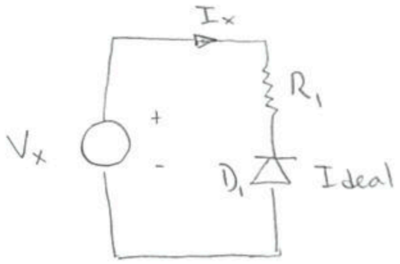
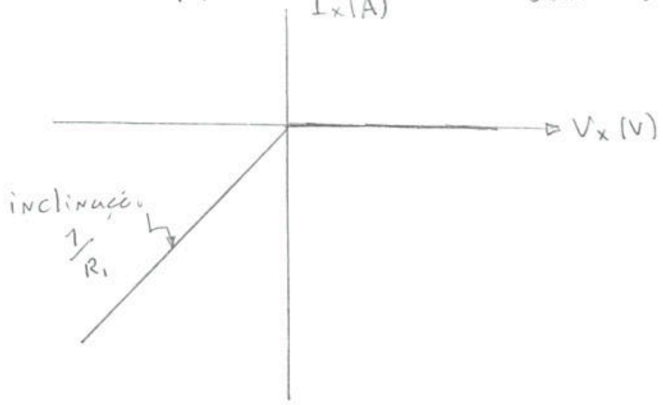
Cap 3

3.1



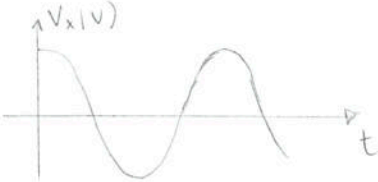
$$I_x = \begin{cases} 0, & V_x > 0 \\ \dfrac{V_x}{R_1}, & V_x < 0 \end{cases}$$

→ Diodo ideal
sem queda de tensão sobre ele



3.2

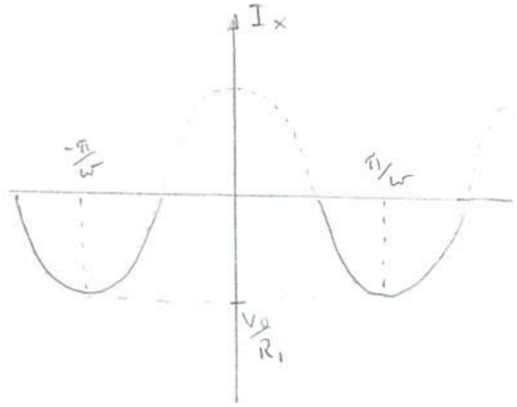
$V_x = V_0 \cos(\omega t)$



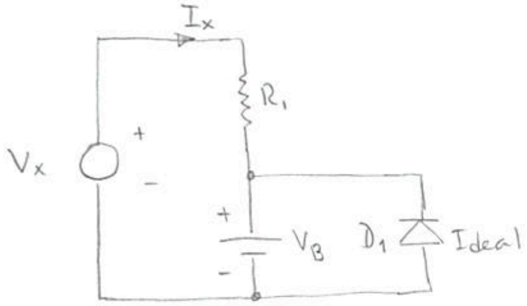
→ corta a corrente positiva

$$I_x = \begin{cases} 0, & V_x < 0 \\ \dfrac{V_x}{R_1}, & V_x > 0 \end{cases}$$

$$I_x = \frac{V_x}{R_1} = \frac{V_0}{R_1} \cos(\omega t)$$



3.6

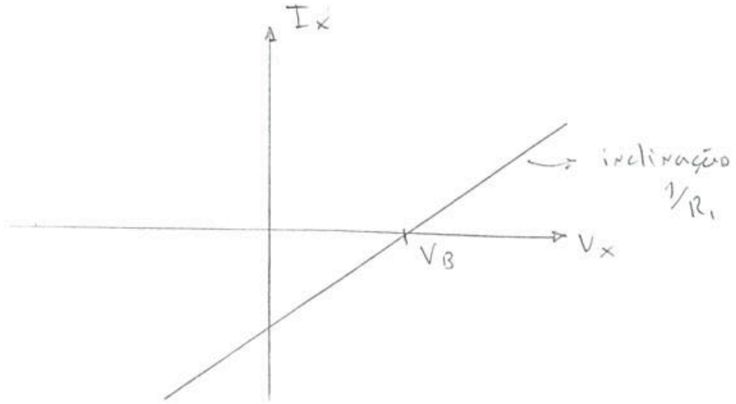


$V_B > 0$

$I_{D1} = 0$ → polarizado reversamente por V_B. (SEMPRE)

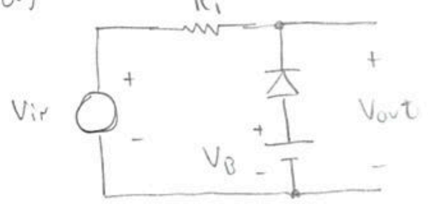
↳ aberto

$$I_x = \frac{V_x - V_B}{R_1}$$

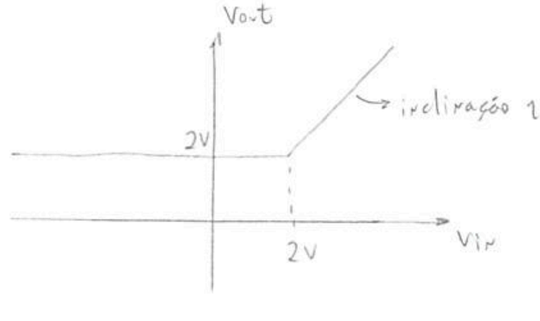


3.9 $V_B = 2V$ → Modelo ideal

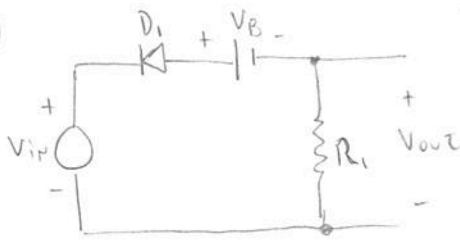
a)



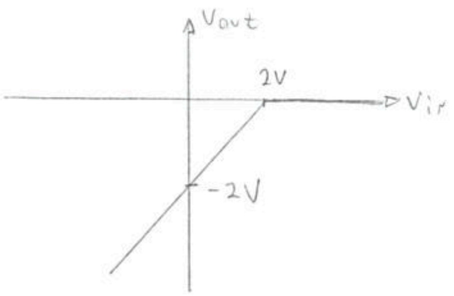
$$V_{out} = \begin{cases} V_B, & V_{in} < V_B \\ V_{in}, & V_{in} > V_B \end{cases}$$



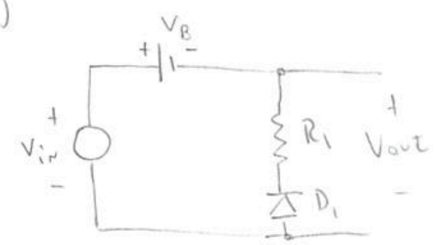
b)



$$V_{out} = \begin{cases} 0, & V_{in} > V_B \\ V_{in} - V_B, & V_B > V_{in} \end{cases}$$

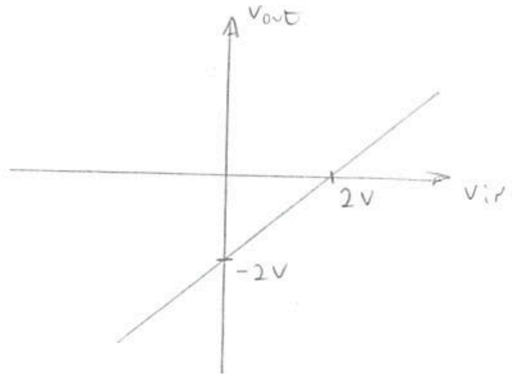


c)

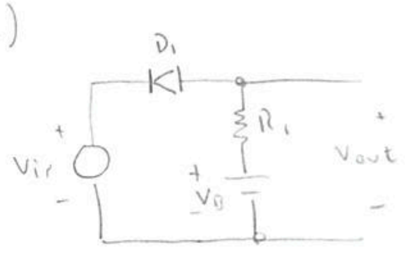


$$V_{out} = \begin{cases} V_{in} - V_B, & V_B > V_{in} \\ V_{in} - V_B, & V_{in} > V_B \end{cases}$$

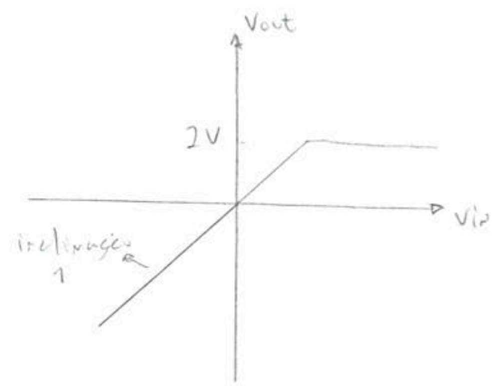
$V_{out} = V_{in} - V_B$



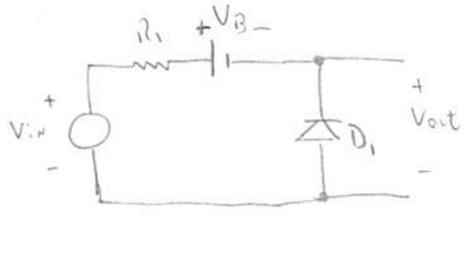
d)



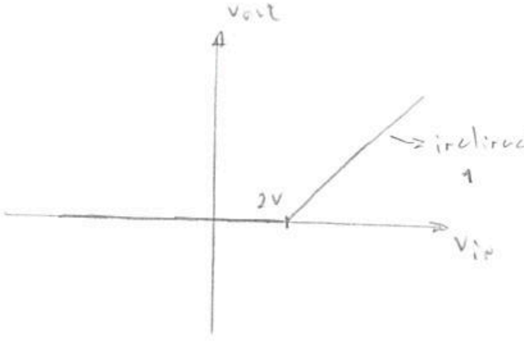
$$V_{out} = \begin{cases} V_{in}, & V_{in} < V_B \\ V_B, & V_{in} > V_B \end{cases}$$



e)

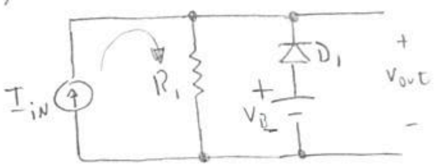


$$V_{out} = \begin{cases} 0, & V_B > V_{in} \\ V_{in} - V_B, & V_B < V_{in} \end{cases}$$



3.18 Modelo tensão ctc → $0,8V = V_{D,on}$ → queda de tensão $V_B = 2V$

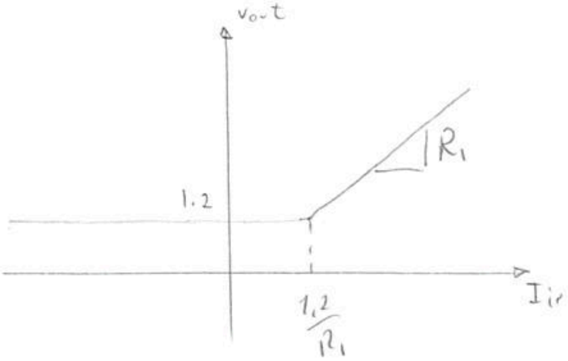
a)



I_{in} não passa por D_1

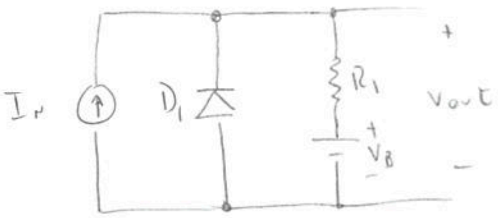
$V_{R_1} = I_{in} \cdot R_1$

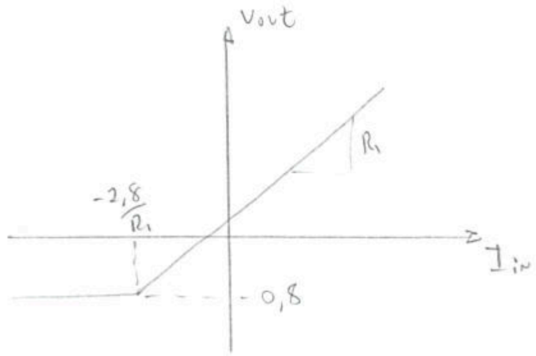
$I_{in} = \frac{V_{R_1}}{R_1}$



$$V_{out} = \begin{cases} V_B - V_{D,on}, & I_{in} < \frac{V_B - V_{D,on}}{R_1} = \frac{1,2}{R_1} \\ I_{in} \cdot R_1, & I_{in} > \frac{1,2}{R_1} \end{cases}$$

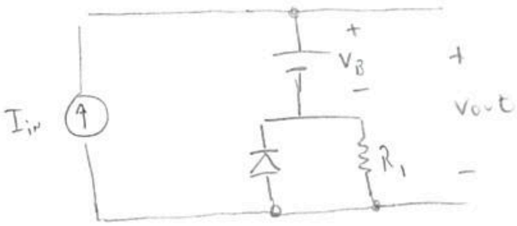
b)

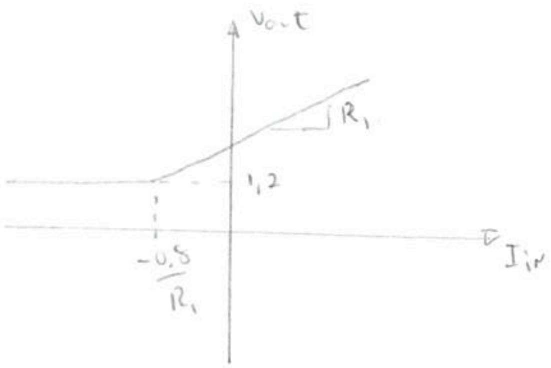




$$V_{out} = \begin{cases} I_{in} \times R_1, & I_{in} > \frac{-V_B - V_{D,on}}{R_{in}} = \frac{-2,8}{R_1} \\ -0,8, & I_{in} < \frac{-2,8}{R_1} \end{cases}$$

c)

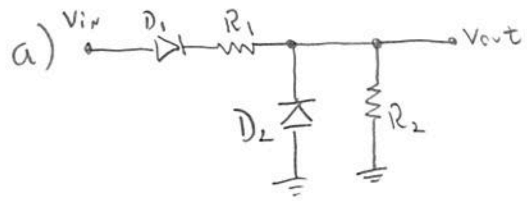


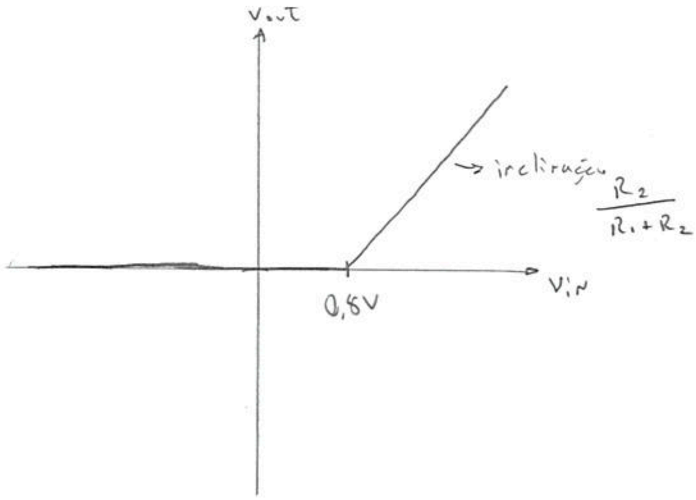


$$V_{out} = \begin{cases} I_{in} \times R_1, & I_{in} > \frac{-0,8}{R_1} \\ V_B - V_{D,on} = 1,2V, & I_{in} < \frac{-0,8}{R_1} \end{cases}$$

3.27 Modelo → aberto
↳ 0,8V

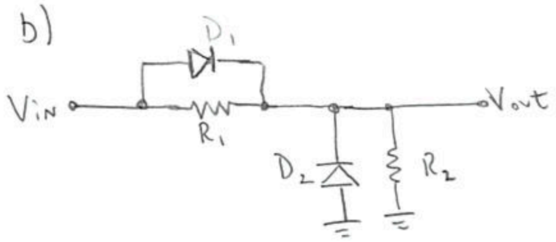
a)

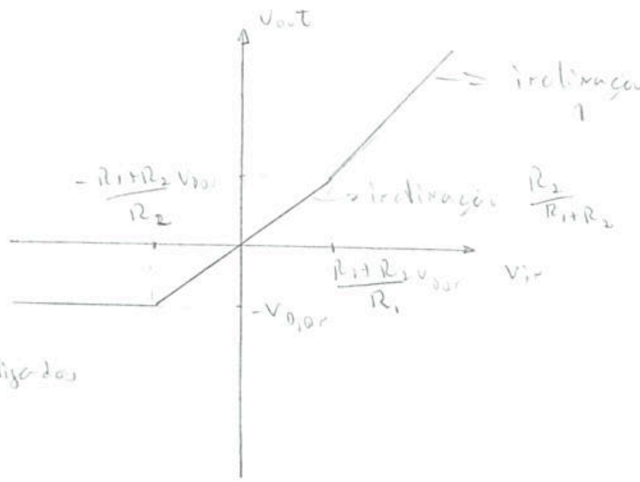




$$V_{out} = \begin{cases} 0, & V_{in} < V_{D,on} = 0,8V \\ (V_{in} - V_{D,on}) \dfrac{R_2}{R_2+R_1}, & V_{in} > V_{Don} \end{cases}$$

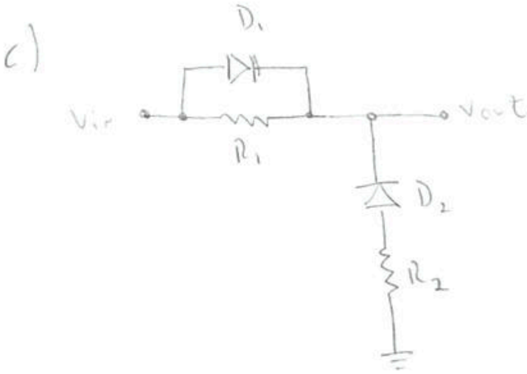
b)

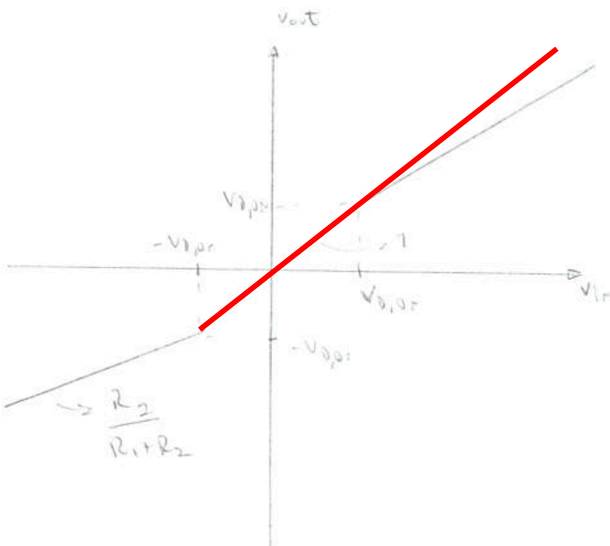




$$V_{out} = \begin{cases} -V_{D,on}, & V_{in} < -\dfrac{R_1+R_2}{R_2} V_{D,on} \text{ (D2 ligado)} \\ V_{in} \dfrac{R_2}{R_1+R_2}, & -\dfrac{R_1+R_2}{R_2} V_{Don} < V_{in} < \dfrac{R_1+R_2}{R_1} V_{D,on} \text{ (Ds desligados)} \\ V_{in} - V_{D,on}, & V_{in} > \dfrac{R_1+R_2}{R_1} \cdot V_{D,on} \text{ (D1 ligado)} \end{cases}$$

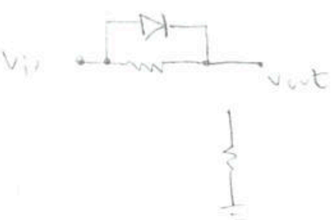
c)



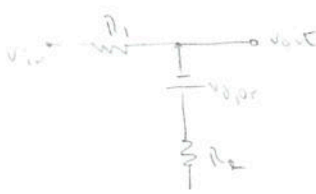


• $V_{D,on} < V_{in} < V_{D,on}$

vin>-vdon



→ $V_{out} = V_{in}$



$$\rightarrow V_{out} = \frac{R_2}{R_1+R_2}(V_{in} + V_{D,on}) - V_{D,on}$$

3.37

$C = ?$

$I_L = 0,5\,A$

$T = 3V$

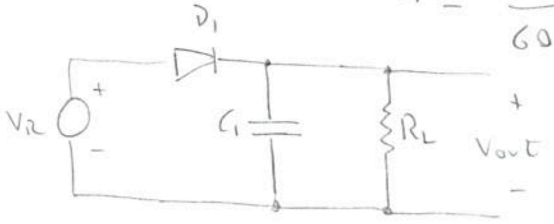
$V_r = 300\,mV$

$f = 60\,Hz$

$$V_R = \frac{V_p - V_{D,on}}{R_L\, C_1\, f_{in}} \quad , \text{ onde } \quad \frac{V_p - V_{D,on}}{R_L} \approx I_L$$

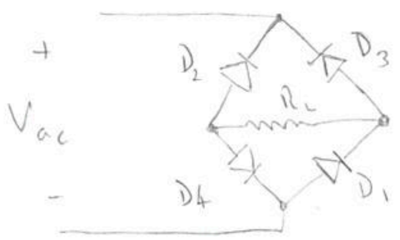
$$V_R = \frac{I_L}{C_1\, f_{in}} = \frac{0,5}{C_1\, 60\,Hz} \leq 300\,mV$$

$$C_1 \geq \frac{0,5}{60 \times 300\,m} = 27,78\,mF$$



3.40

→ D_3 está invertido!



- No semi-ciclo positivo da tensão AC, o retificador não terá tensão sobre a carga, D_2 e D_3 polarizados de modo a impedir a passagem da corrente. $V_{out} = 0\,V$

- No semi-ciclo negativo, D_1 e D_3 conduzirão, e portanto, novamente não haverá corrente pela carga R_L. $V_{out} = 0\,V$.

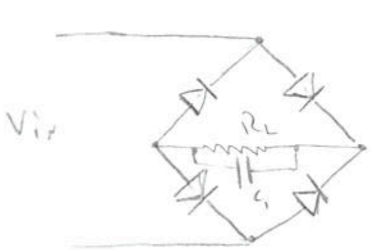
3.41

$V_{in} = V_0 \cos \omega t$ $\quad \omega = 2\pi\, 60$ $\quad V_{D,on} = 0,8V$

$V_0 = 3V$

$C_1 = 1000\,\mu F$

$R_L = 30\,\Omega$



$$V_r = \frac{1}{2} \cdot \frac{V_p - 2\,V_{D,on}}{R_L\, C_1 \cdot f_{in}}$$

$$V_r = \frac{1}{2} \cdot \frac{3 - 1,6}{30 \times 1000\mu \times 60} = 389\,mV$$

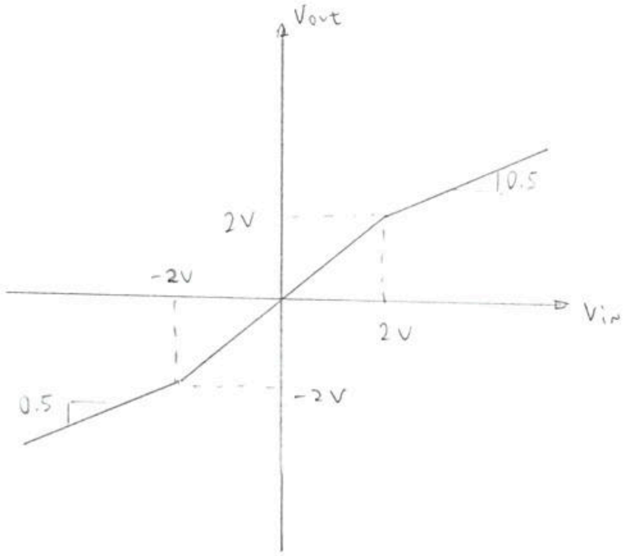
3.47

Projetar

Resistores de $1K\Omega$

Considerando diodos reais, $V_{D,on} = 0,8V$

Outros componentes → fonte de tensão



$$V_{out} = \begin{cases} V_{in}, & -2V \leq V_{in} \leq 2V \\ 2 + \frac{(V_{in}-2)}{2}, & |V_{in}| > 2 \end{cases}$$

Diodos podem fazer papel de corte para $|V_{in}| > 2V$

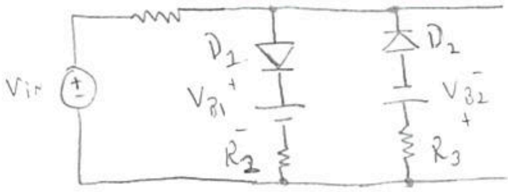
Para um diodo atuar, $V_D = 0,8V$. Utilizando fontes de tensão auxiliares, podemos fazer com que eles atuem quando $V_{in} = \pm 2V$.

$$V_B = V_{in} - V_{D,on} = 2 - 0,8V = 1,2V$$

→ Precisamos de duas malhas para fazer a mudança para $|V_{in}| > 2V$.

→ Se $|V_{in}| > 2V$, devemos ter um divisor de tensão no circuito (inclinação de 0,5)

Portanto:



$V_{B1} = V_{B2} = 1,2V$

. Quando $V_{in} > 2V$, D_1 atua.

. Quando $V_{in} < -2V$, D_2 atua

→ Divisor de tensão:

$$V_{out} = \frac{R_2}{R_1 + R_2} \times V_{in} = \frac{1}{2} V_{in} \rightarrow \frac{R_2}{R_1 + R_2} = \frac{1}{2} \rightarrow R_2 = R_1$$

$R_2 = R_1 = 1K\Omega$, e $R_2 = R_3$ (simetria da saída desejada).

→ Quando $|V_{in}| < 2$, as fontes V_B se cancelam, deixando apenas V_{in} na saída.