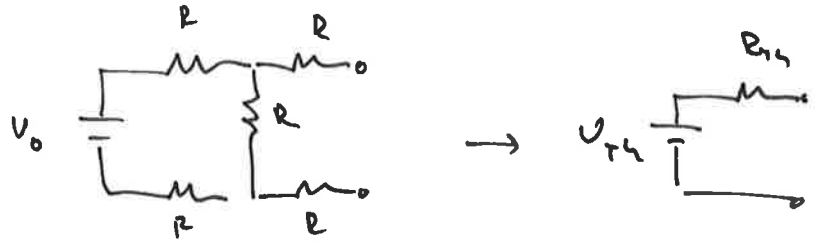
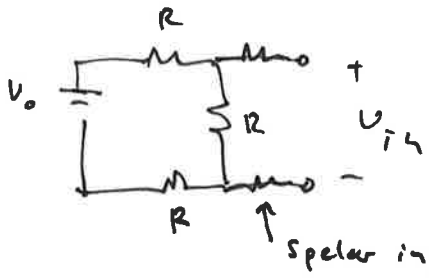
1)

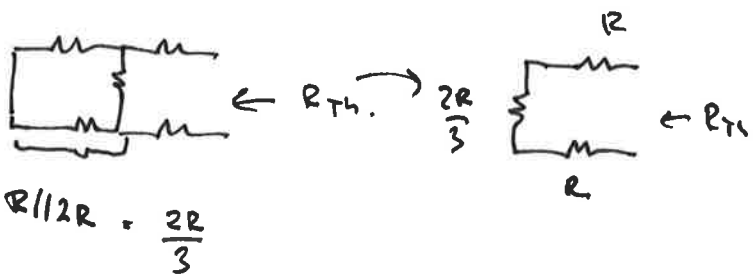


V_{TH}: tomgångsspänning:



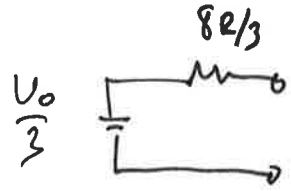
Sp. delning: $V_{TH} = \frac{R}{3R} \cdot V_0 = \frac{V_0}{3}$

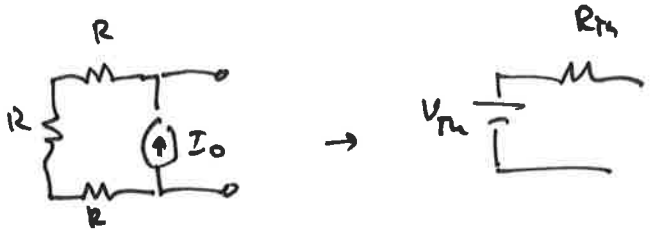
R_{TH}: Nollställ V_0



$R/\!/2R = \frac{2R}{3}$

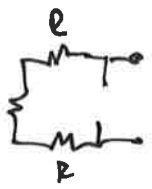
$R_{TH} = 2R + \frac{2R}{3} = \frac{8R}{3}$



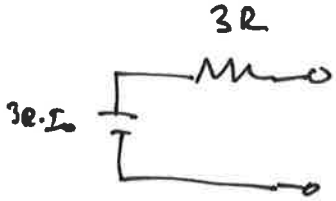


V_{TH}: Tomgångsspänning: $V_{TH} = I_0 \cdot 3R$

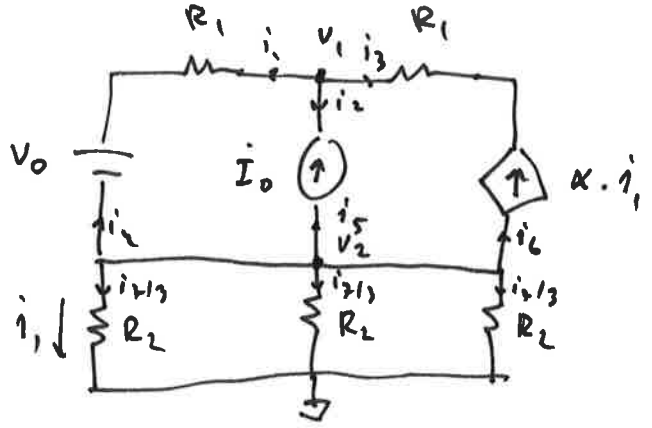
R_{TH}: Nollställ I_0 (Avbrott!)



$= 1$ $R_{TH} = 3R$



2)



KCL nod 1) $i_1 + i_2 + i_3 = 0 \Rightarrow \frac{V_1 - V_0 - V_2}{R_1} - i_0 - \alpha \cdot i_1 = 0$

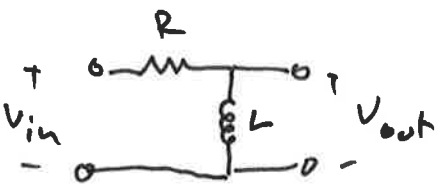
KCL nod 2) $i_4 + i_5 + i_6 + 3 \cdot \frac{i_7}{3} = 0 \Rightarrow \frac{V_2 + V_0 - V_1}{R_1} + i_0 + \alpha i_1 + \frac{V_2 3}{R_2} = 0$

$i_1 = \frac{V_2}{R_2}$ För eliminering av i_1.

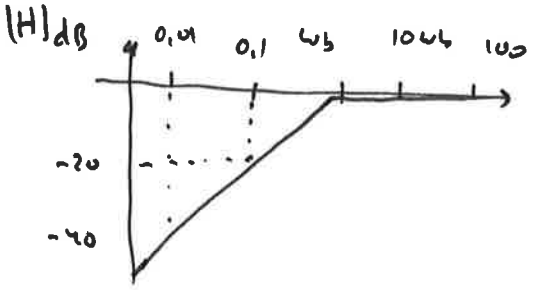
1) $\frac{V_1}{R_1} - \frac{V_2}{R_1} - \frac{V_0}{R_1} - i_0 - \frac{\alpha \cdot V_2}{R_2} = 0 \Rightarrow \underline{\underline{\frac{1}{R_1} \cdot V_1 + \left(\frac{-1}{R_1} + \frac{\alpha}{R_2}\right) \cdot V_2 = i_0 + \frac{V_0}{R_1}}}$

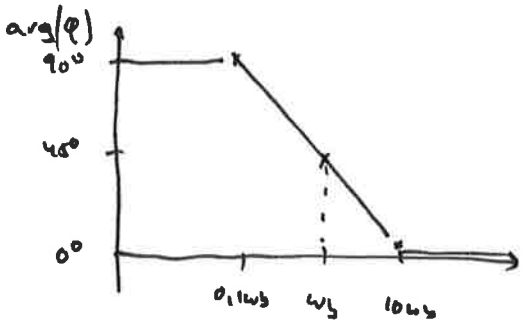
2) $\frac{-V_1}{R_1} + \frac{V_2}{R_1} + \frac{V_2 \cdot 3}{R_2} + \frac{V_0}{R_1} + i_0 + \frac{\alpha V_2}{R_2} = 0 \Rightarrow \underline{\underline{\left(\frac{-1}{R_1}\right) \cdot V_1 + \left(\frac{1}{R_1} + \frac{3+\alpha}{R_2}\right) \cdot V_2 = -i_0 - \frac{V_0}{R_1}}}$

3)



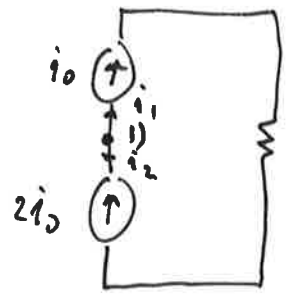
$$\omega_B = \frac{R}{L} \quad \Rightarrow \quad L = \frac{R}{\omega_B} = \frac{10^3}{10^6} = \underline{\underline{1\,mH}}$$





4)

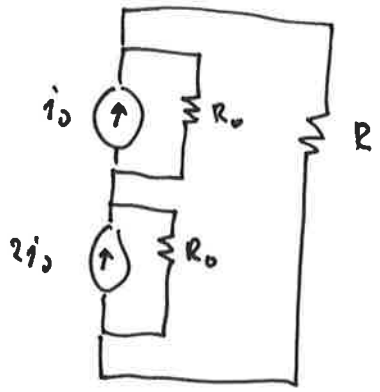
a)

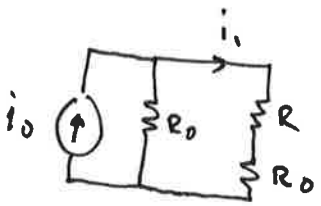


KCL på nod 1): $i_1 + i_2 = 0 \Rightarrow i_0 - 2i_0 = 0$ vilket ej kan uppfyllas! Kretsen skulle alltså bryta mot KCL.

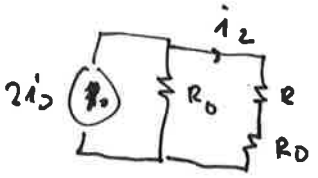
b)

Superposition.





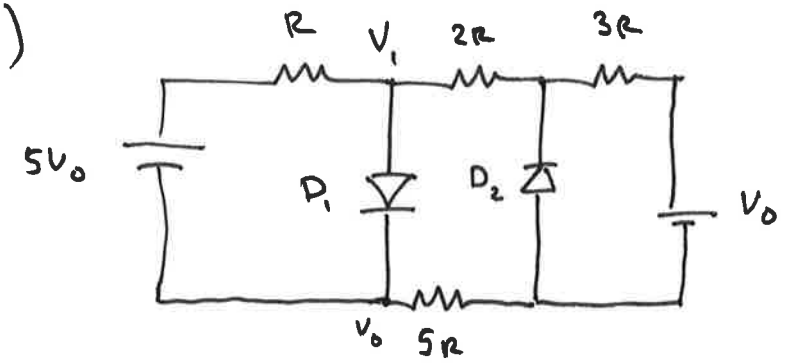
$$i_1 = i_0 \cdot \frac{R_0}{R+R_0+R_0} = \frac{i_0}{2}$$



$$i_2 = 2i_0 \cdot \frac{R_0}{R+R_0+R_0} = i_0$$

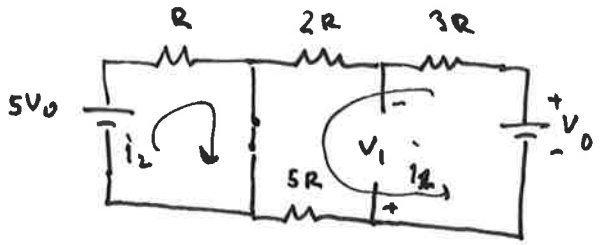
$$\Rightarrow i_R = i_1 + i_2 = \frac{3i_0}{2}$$

5)



$V_1 > V_0$, gissar att D_1 är framspänd! D_2 bör vara backspänd.

=>



Ex superposition, eller KVL:

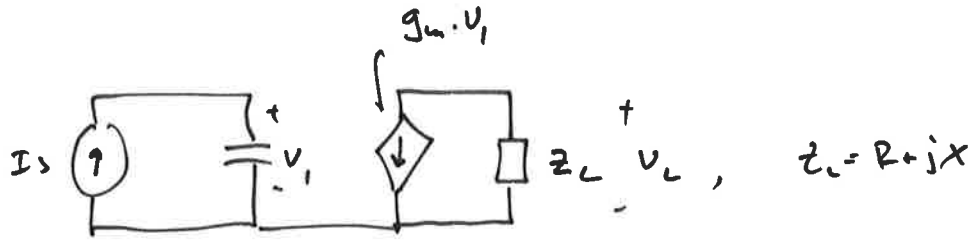
$$i_1 = \frac{V_0}{2R+3R+5R} = \frac{V_0}{10R} \qquad \left(i_L = \frac{5V_0}{R}\right)$$

Kontroll: D_1: i_1 och $i_2 > 0$ ok!

$$V_1 = 0 - (V_0 - i_1 \cdot 3R) = -V_0 + \frac{3V_0 \cancel{R}}{10\cancel{R}} = -V_0\left(1 - \frac{3}{10}\right) < 0!$$

ok, D_2 backspänd!

6)



$Z_L = R + jX$

a) $V_L = -g_m \cdot V_1 \cdot Z_L$

$V_1 = \frac{I_s}{j\omega C}$

$\Rightarrow H = \frac{V_L}{I_s} = \frac{-g_m \cdot (R+jX)}{j\omega C} = \frac{g_m(-X+jR)}{\omega C}$

b) $H = \frac{g_m}{\omega C}\sqrt{X^2+R^2} \cdot e^{j\arctan\frac{R}{X}}$

$\arctan(0) = 0 \Rightarrow \underline{\underline{R=0}}$

Fasen
Detta blir egentligen
~~Detta~~ $\pi - \arctan\frac{R}{|X|}$, då
~~Re~~ imag $|H| \leq 0$!
Vilket ger en fasförskjutning på
π då $R=0$.. Detta var inte
~~100%~~ riktigt menigen...

c) $|H|$ beroende av ω? R, C eller C?

$|H| = \frac{g_m}{\omega C}\sqrt{X^2+R^2} =$ vi vet $R=0$, $X = \omega L$ (induktans!)

$= \frac{g_m}{\omega C} \cdot (\omega L)^2 = \underline{\underline{\frac{g_m \cdot L}{C}}}$

Dvs vi vet Z_L som en kondensator!