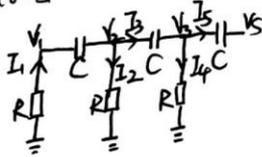


## Electronique devoir3 Cécilia LiSha ZY1924115

Q1 Comme  $R_1 = R_2 = R_3 = R_4 = R$   
 $C_1 = C_2 = C_3 = C$   
 $U_- = U_+ = 0$ .

alors



$$I_1 = \frac{0 - V_1}{R} = -j\omega C(V_1 - V_2)$$

$$\Rightarrow V_2 = \left(1 + \frac{1}{j\omega RC}\right) V_1$$

$$I_1 = I_2 + I_3, \quad I_2 = \frac{V_2 - 0}{R} = \frac{V_2}{R}$$

$$I_3 = j\omega C(V_2 - V_3)$$

$$I_3 = I_4 + I_5, \quad I_4 = \frac{V_3 - 0}{R} = \frac{V_3}{R}$$

$$I_5 = j\omega C(V_3 - V_s)$$

$$\Rightarrow V_2 = \left(1 + \frac{1}{j\omega RC}\right) V_1$$

$$V_3 = \left(2 + \frac{1}{j\omega RC}\right) V_2 - V_1$$

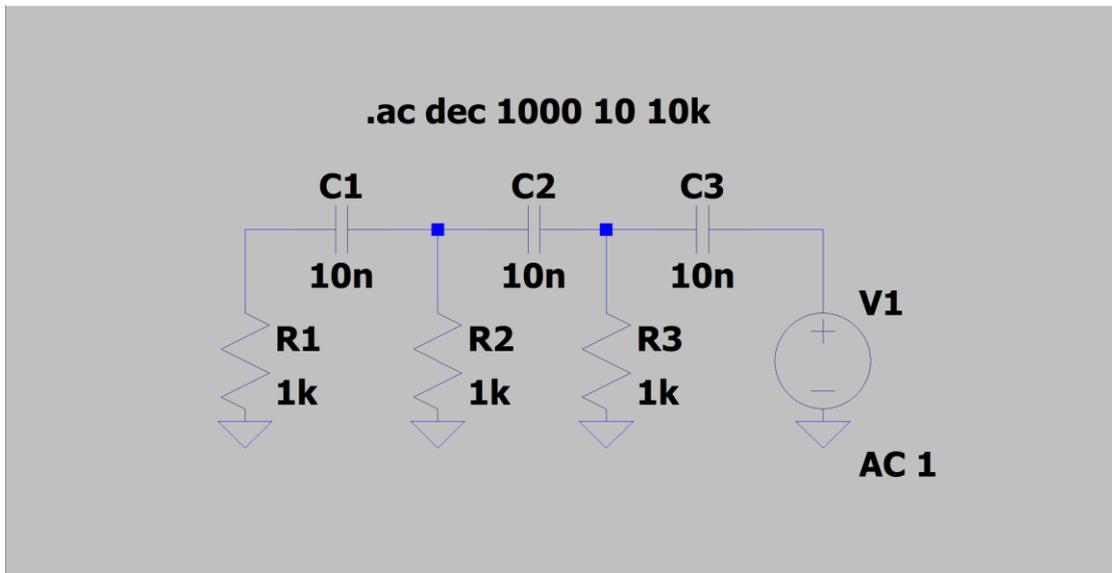
$$V_2 = \frac{(2j\omega RC + 1)V_1 + j\omega CV_s}{(j\omega RC + 1)(3 + \frac{1}{j\omega RC})}$$

alors, on a.

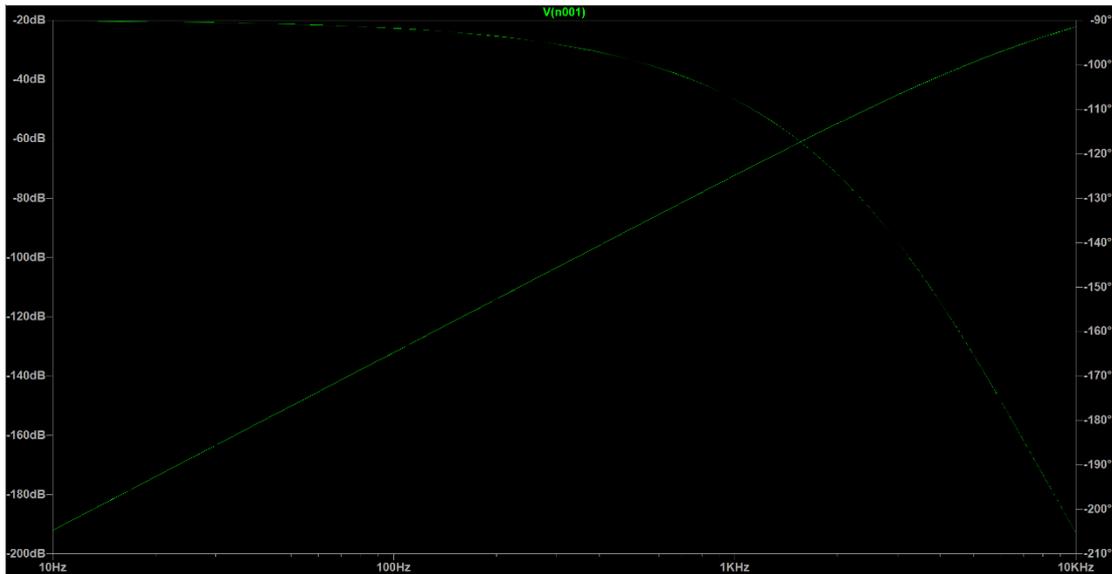
$$\frac{V_{s1}}{V_s} = \frac{1}{1 + \frac{1}{j\omega RC} + \frac{5}{(j\omega RC)^2} + \frac{1}{(j\omega RC)^3}}$$

$$\frac{V_1}{V_s} = \frac{1}{1 - \frac{5}{(\omega RC)^2} + j\left(-\frac{6}{\omega RC} + \frac{1}{(\omega RC)^3}\right)}$$

Q2. On fait la simulation :



Les résultats :



$$Q3. \quad \varphi = -\arctan \frac{6(\omega CR)^2 - 1}{(\omega CR)^2 - 5\omega CR}$$

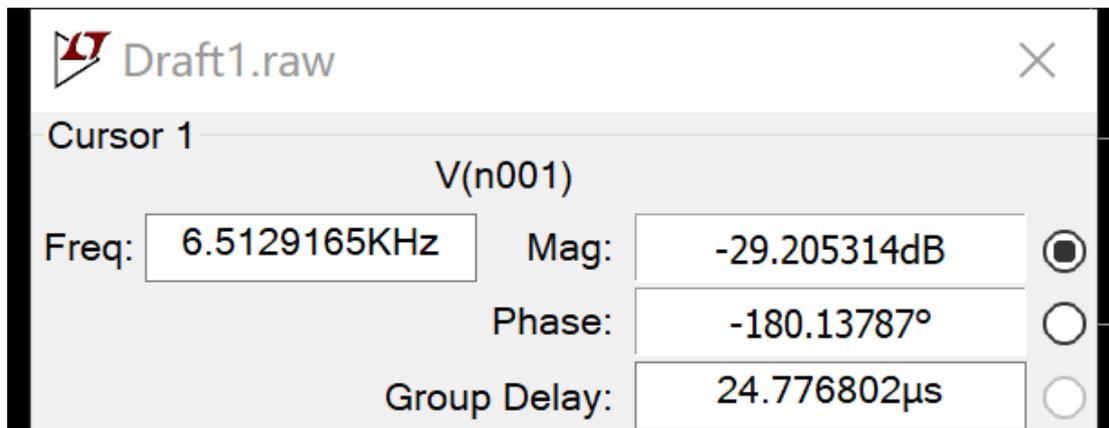
$$\text{or } \varphi = -\pi$$

$$\text{alors } \omega = \frac{1}{\sqrt{6}} CR$$

$$\Rightarrow f_0 = \frac{\omega}{2\pi} = \frac{1}{2\pi\sqrt{6} CR} \approx 6498 \text{ Hz}$$

$$A = \frac{1}{\beta} = 29.$$

Numériquement :



$F_0 = 6.51\text{kHz}$ , vers  $6.5\text{kHz}$ ,  $A=29.2$ , vers  $29$ .

**Q4.** La valeur théorique est 1. On calcule numériquement par choisir un autre point proche de  $F_0$ .

Cursor 1

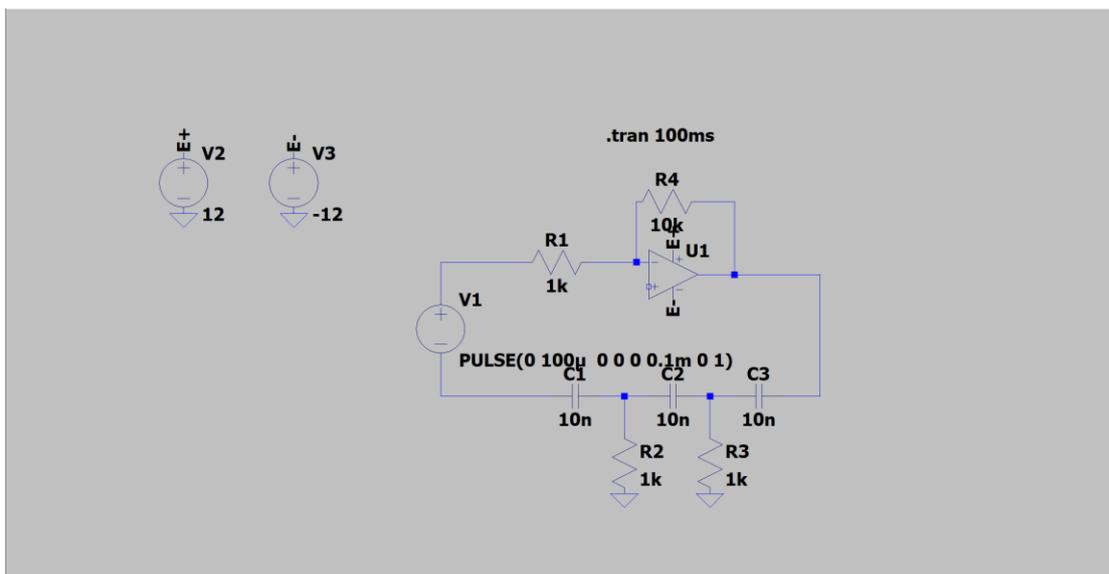
V(n001)

Freq:	6.5320729KHz	Mag:	-29.152625dB	<input checked="" type="radio"/>
		Phase:	-180.30853°	<input type="radio"/>
		Group Delay:	24.713977μs	<input type="radio"/>

Alors, la valeur numérique est 1.0107, c'est presque le même.

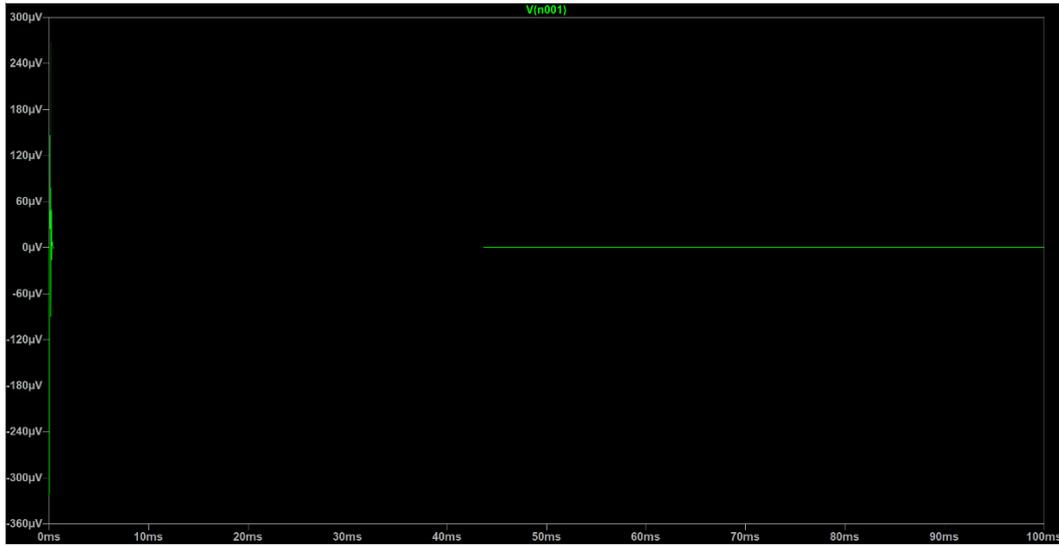
$$k = \left| \frac{w_0 d\varphi}{2\pi df} \right| = \left| \frac{w_0}{2\pi} \frac{(-180.13787 + 180.30853) \pm 180 \times n}{6.5129105 - 6.5320729} \right| \approx 1.0107$$

Q5.

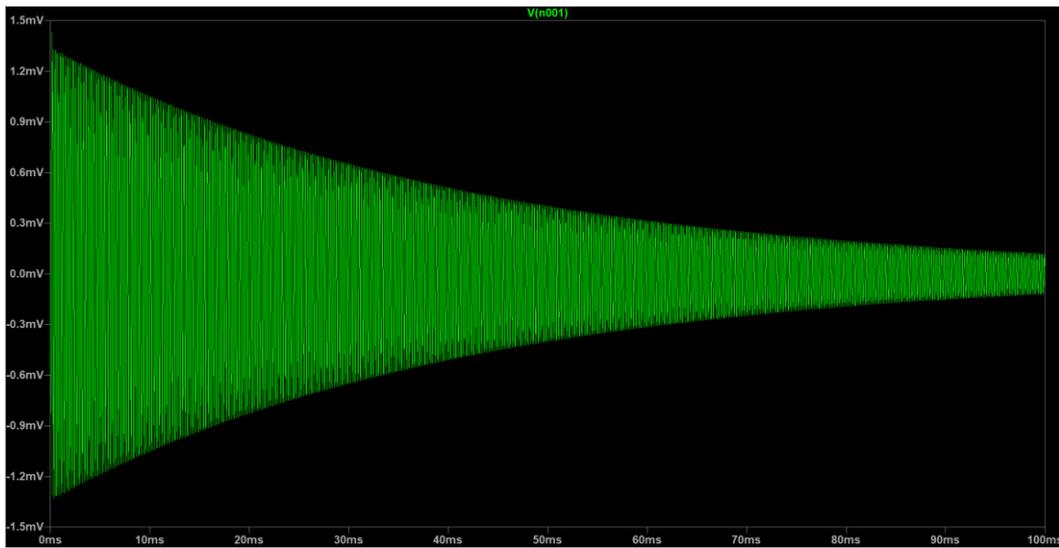


Q6.

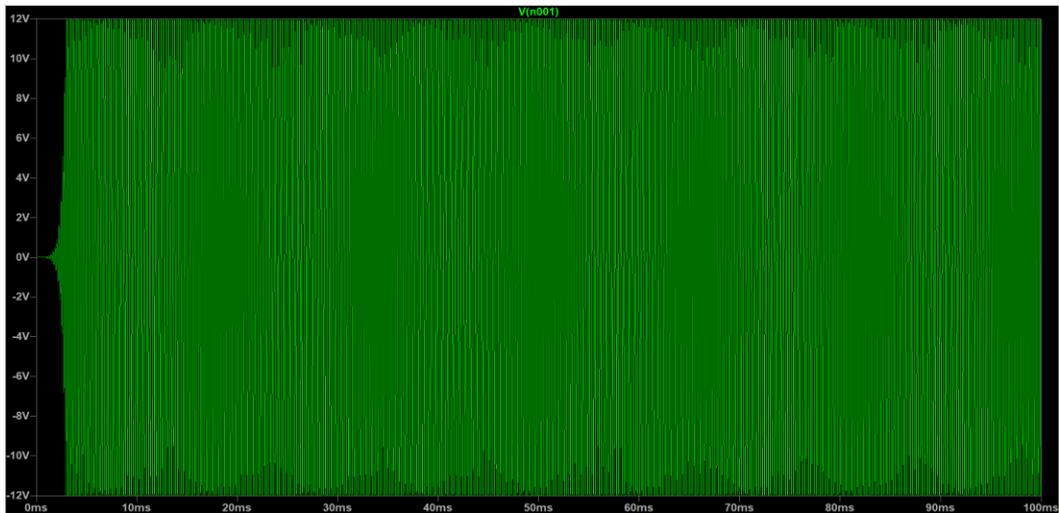
Cas1 R2=10K, Aβ<1



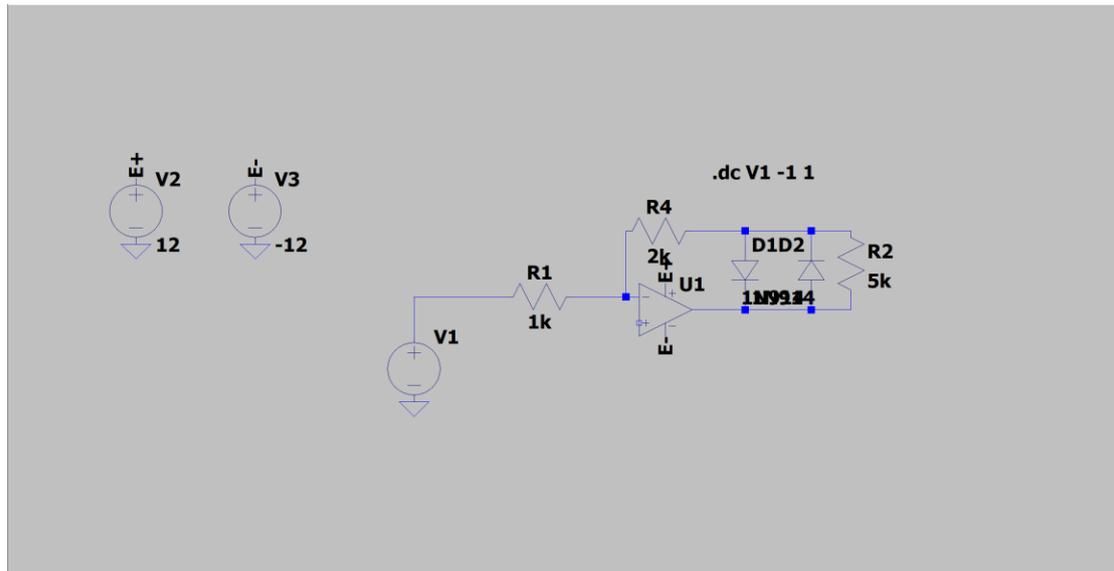
Cas2 R2=29K,  $A\beta=1$



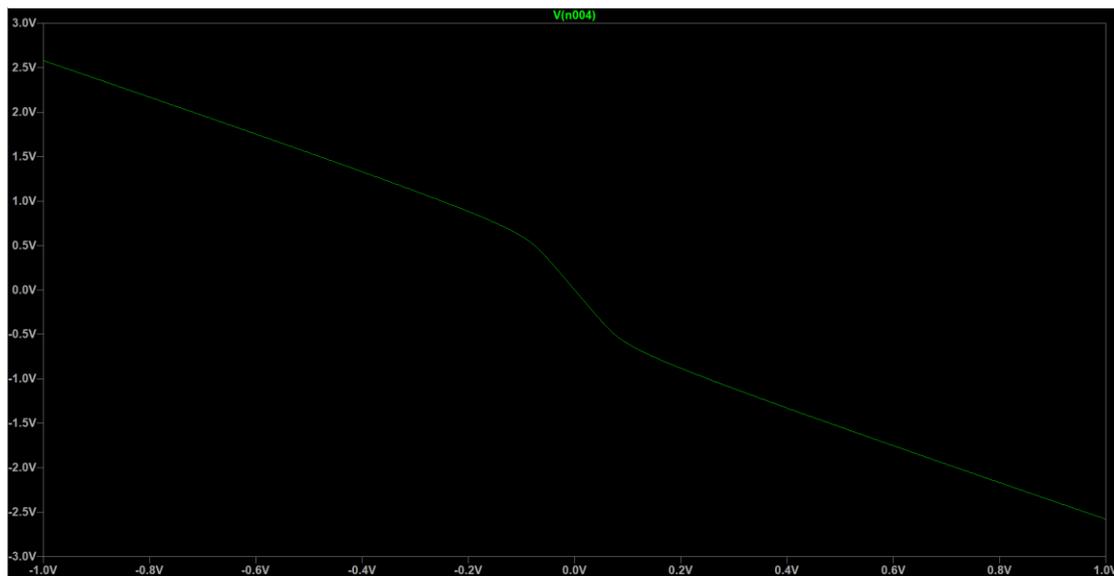
Cas3 R2=50K,  $A\beta > 1$



Q7.



Q8



La courbe n'est pas linéaire autour de 0V.