Solution

1.

$$Av = \frac{1/jC\omega}{R + 1/jC\omega} = \frac{1}{1 + jRC\omega} = \frac{1}{1 + j\omega/\omega_0}$$

$$|Av| = \frac{1}{\sqrt{1 + (\frac{\omega}{\omega_0})^2}} = \frac{1}{\sqrt{1 + \left(\frac{f}{fc}\right)^2}}$$

2. $\omega_0 = RC = 2\pi fc \quad \Rightarrow \quad fc = 1/2\pi RC = 7{,}96$ kHz (fréquence de coupure)

3. à la fréquence de coupure : f = fc

$$|Av| = \frac{Us}{Ue} = \frac{1}{\sqrt{1+\left(\frac{f}{fc}\right)^2}} = \frac{1}{\sqrt{1+(1)^2}} = \frac{1}{\sqrt{2}} \qquad \mathbf{Us = \frac{10}{\sqrt{2}} = 7{,}07V}$$

$$G(dB) = 20\log|Av| = 20\log\frac{1}{\sqrt{2}} \qquad \mathbf{G(dB) = -3dB}$$

$$\varphi = -\text{Arctg}\,\omega/\omega_0 = -\text{Arctg}1 \qquad \mathbf{\varphi = -45^\circ}$$

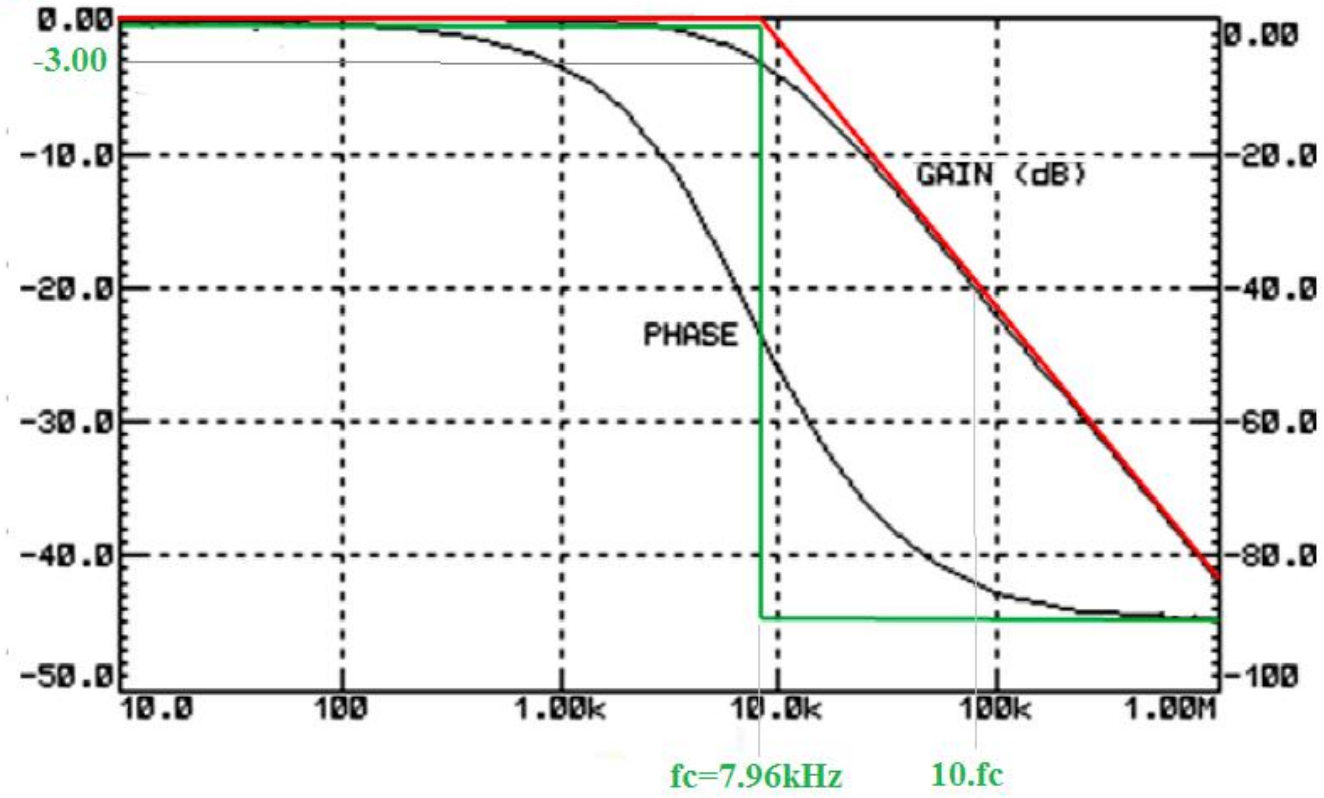
4. $$G(dB) = 20\log|Av| = 20\log\frac{1}{\sqrt{1+\left(\frac{\omega}{\omega_0}\right)^2}} = 20\log 1 - 10\log(1 + (\omega/\omega_0)^2)$$

$$G(dB) = -10\log(1 + (\omega/\omega_0)^2) = -10\log(1 + (f/fc)^2)$$

$$\varphi = -\text{Arctg}\,\omega/\omega_0 = -\text{Arctg}\,f/fc$$

	f(Hz)	Us(V)	Av(dB)	φ (degré)
fc	7957,75	7,07	- 3,01	- 45,00
fc/10	795,77	9,95	- 0,04	- 5,71
fc/2	3978,87	8,94	- 0,97	- 26,57
2fc	15915,49	4,47	- 6,99	- 63,43
10fc	79577,47	1,00	- 20,04	- 84,29

5.


0.00
-3.00
-10.0
-20.0
-30.0
-40.0
-50.0
0.00
20.0
40.0
60.0
80.0
100
GAIN (dB)
PHASE
10.0
100
1.00k
10.0k
100k
1.00M
fc=7.96kHz
10.fc