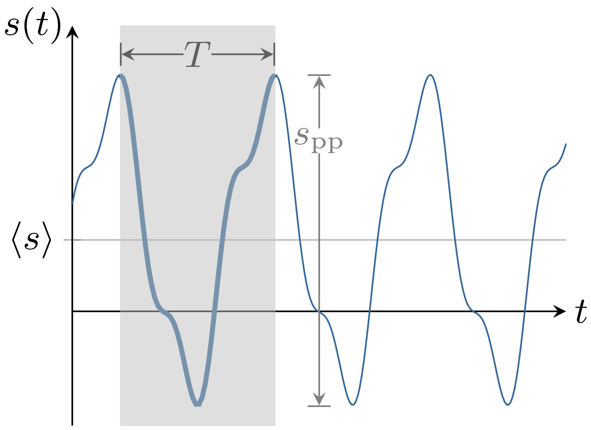
RÉSUMÉ

I Signaux périodiques



Théorème de Fourier
décomposition en série de Fourier du signal $s(t)$:

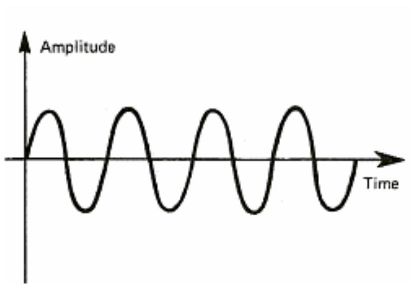
$$\boxed{s(t) = a_0 + \sum_{k=1}^{\infty} a_k \cos(k\omega t) + b_k \sin(k\omega t)}$$

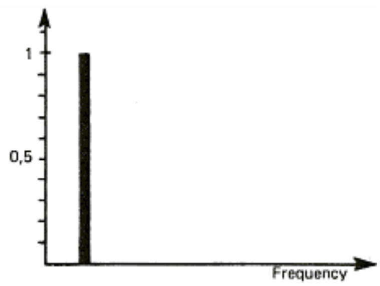
$$\boxed{s_{RMS}^2 = \langle s^2 \rangle = a_0^2 + \frac{1}{2}\sum_{1}^{\infty} a_k^2 + b_k^2}$$

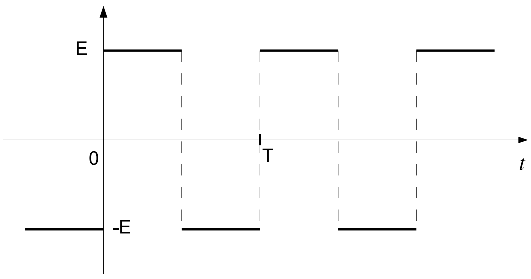
Analyse spectrale

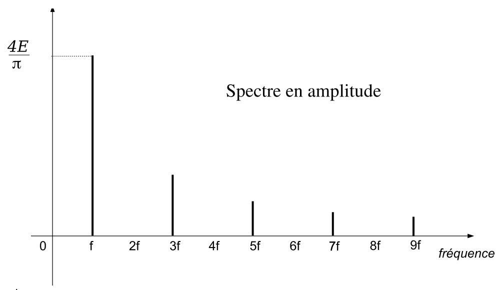
Représentation temporelle

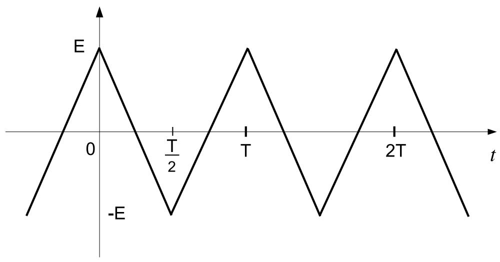
spectre

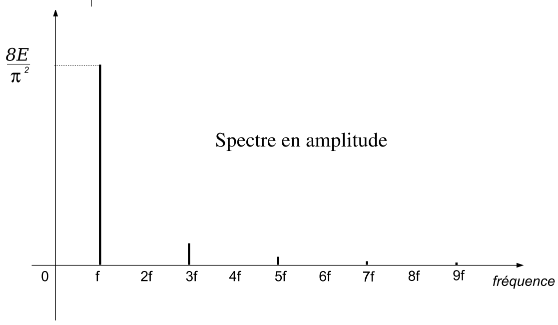




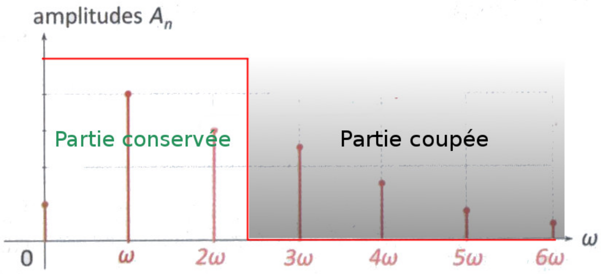
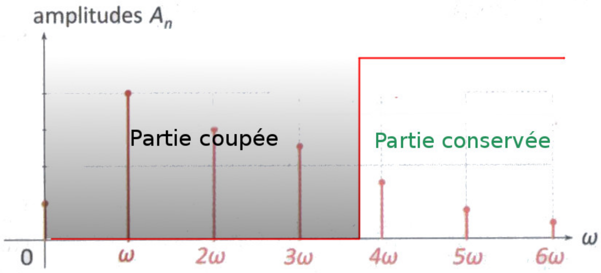
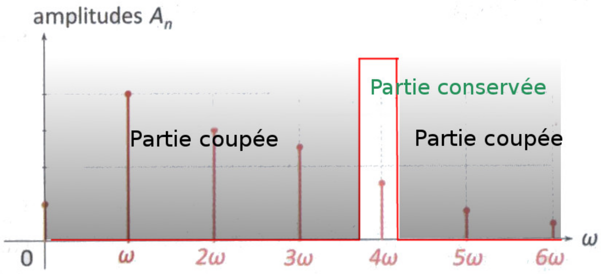
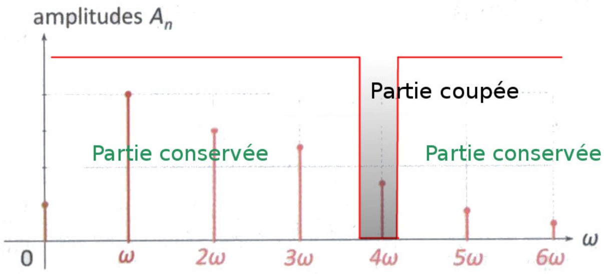






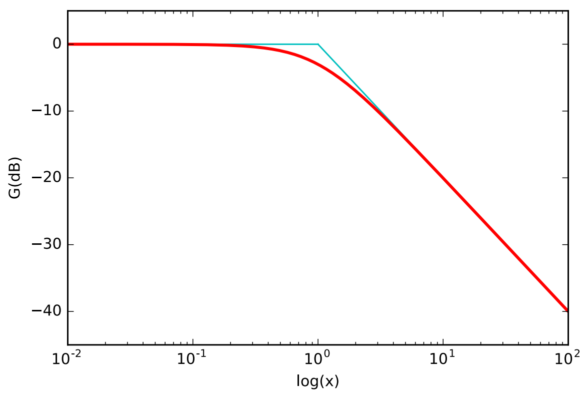
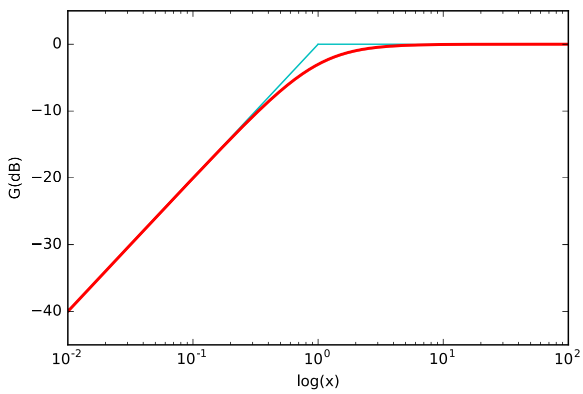


II Filtrage linéaire

Type de filtre	Effets souhaités	Gabarit du filtre
Filtre passe-bas	Laisse passer les basses fréquences et atténue voire supprime/coupe les hautes fréquences.	
Filtre passe-haut	Laisse passer les hautes fréquences et atténue voire supprime/coupe les basses fréquences	
Filtre passe-bande	Laisse passer une gamme de moyennes fréquences et atténue voire supprime/coupe les autres fréquences	
Filtre coupe-bande	Coupe une gamme de moyennes fréquences et laisse passer les autres fréquences	

Filtre du 1er ordre

Avec dans le tableau suivant H_0 le gain statique, $x = \dfrac{\omega}{\omega_0}$ et $\omega_0 = \dfrac{1}{RC}$.

<table>
<tr><th>Passe–bas du 1er ordre</th><th>Passe–haut du 1er ordre</th></tr>
<tr><td>$$\underline{\mathcal{H}}(x) = \frac{H_0}{1+jx}$$
$$G(x) = \frac{H_0}{\sqrt{1+x^2}}$$
$$G_{dB}(x) = 20\log(H_0) - 10\log(1+x^2)$$
$$\phi(x) = -\arctan(x)$$</td><td>$$\underline{\mathcal{H}}(x) = \frac{H_0 jx}{1+jx}$$
$$G(x) = \frac{H_0 x}{\sqrt{1+x^2}}$$
$$G_{dB}(x) = 20\log(H_0) + 20\log(x) - 10\log(1+x^2)$$
$$\phi(x) = \frac{\pi}{2} - \arctan(x)$$</td></tr>
<tr><td>Pulsation de coupure $\omega_c = \omega_0$</td><td>Pulsation de coupure $\omega_c = \omega_0$</td></tr>
<tr><td>
</td><td>
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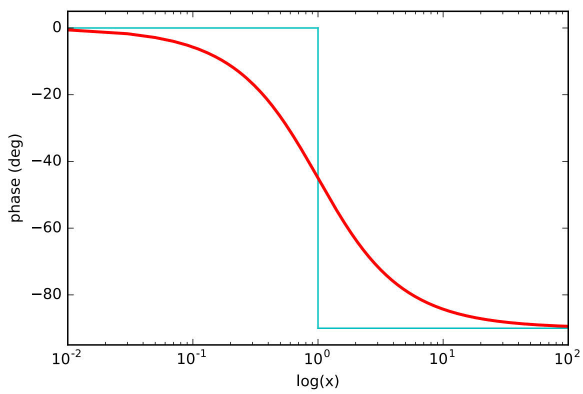
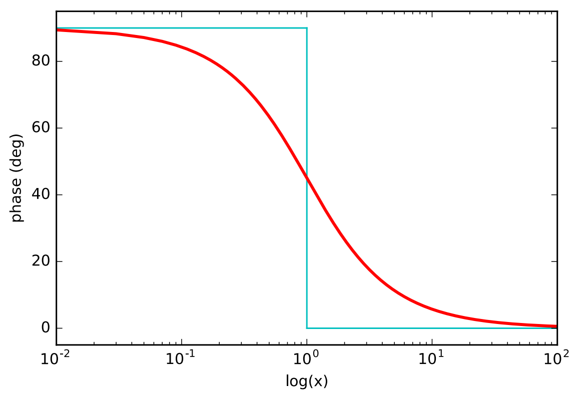
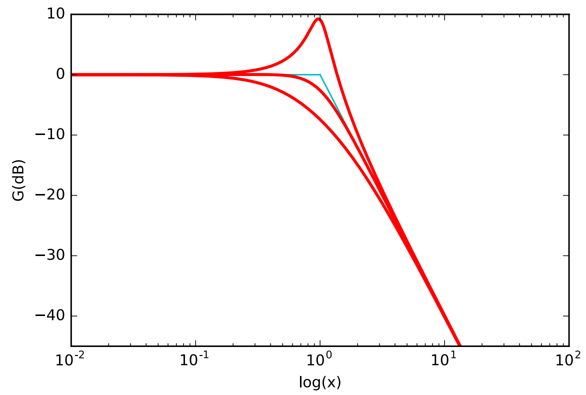
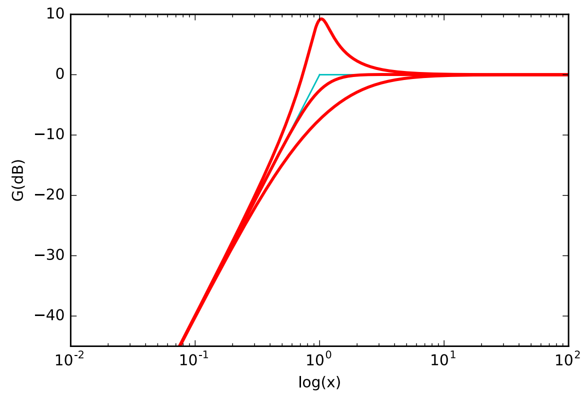
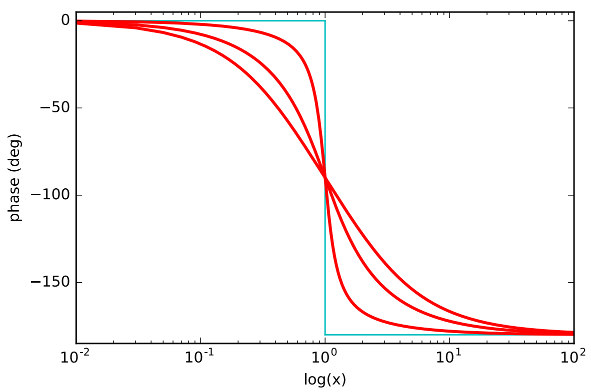
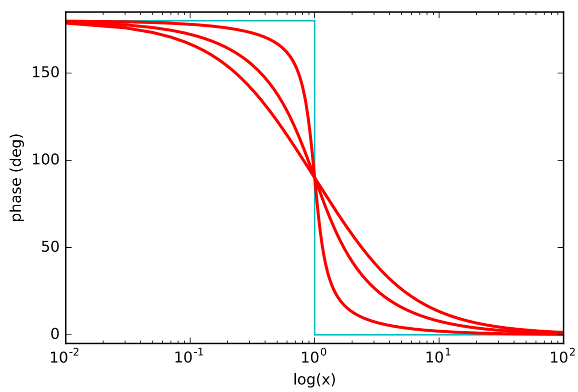
<tr><td>
</td><td>
</td></tr>
</table>

Filtre du 2ème ordre

Avec dans le tableau suivant H_0 le gain statique, $x = \dfrac{\omega}{\omega_0}$ et $\omega_0 = \dfrac{1}{\sqrt{LC}}$ et $Q = \dfrac{1}{R}\sqrt{\dfrac{L}{C}}$

Passe–bas du 2ème ordre	Passe–haut du 2ème ordre
$\underline{\mathcal{H}}(x) = \dfrac{H_0}{1 + jx/Q - x^2}$ $G(x) = \dfrac{H_0}{\sqrt{(1-x^2)^2 + (x/Q)^2}}$ $G_{dB}(x) = 20\log(H_0) - 10\log((1-x^2)^2 + (x/Q)^2)$ $\phi(x) = -\dfrac{\pi}{2} - \arctan\left(\dfrac{x^2-1}{x/Q}\right)$	$\underline{\mathcal{H}}(x) = \dfrac{-H_0 x^2}{1 + jx/Q - x^2}$ $G(x) = \dfrac{H_0 x^2}{\sqrt{(1-x^2)^2 + (x/Q)^2}}$ $G_{dB}(x) = 20\log(H_0) + 40\log(x) - 10\log((1-x^2)^2 + (x/Q)^2)$ $\phi(x) = \dfrac{\pi}{2} - \arctan\left(\dfrac{x^2-1}{x/Q}\right)$
Résonance si $Q > 1/\sqrt{2}$ en $x_r = \sqrt{1 - 1/2Q^2}$ alors $G_{dB,max} = 20\log(H_0) + 10\log\left(\dfrac{4Q^4}{4Q^2-1}\right)$	Résonance si $Q > 1/\sqrt{2}$ en $x_r = \dfrac{1}{\sqrt{1 - 1/2Q^2}}$ alors $G_{dB,max} = 20\log(H_0) + 10\log\left(\dfrac{4Q^4}{4Q^2-1}\right)$
	
	

$$\underline{\mathcal{H}}(x) = \frac{H_0 jx/Q}{1 + jx/Q - x^2} = \frac{H_0}{1 + jQ(x - 1/x)}$$
$$G(x) = \frac{H_0 x/Q}{\sqrt{(1-x^2)^2 + (x/Q)^2}} = \frac{H_0}{\sqrt{1 + Q^2(x - 1/x)^2}}$$
$$G_{dB}(x) = 20\log(H_0/Q) + 20\log(x) - 10\log((1-x^2)^2 + (x/Q)^2) = 20\log(H_0) - 10\log(1 + Q^2(x-1/x)^2)$$
$$\phi(x) = -\arctan\left(\frac{1-x^2}{x/Q}\right) = -\arctan(Q(x - 1/x))$$

$$\text{Pulsation de coupure } x_c = \pm\frac{1}{2Q} + \sqrt{\frac{1}{4Q^2} + 1}$$
$$\text{Bande passante } \Delta\omega = \Delta_c\omega_0 = \frac{\omega_0}{Q}$$
$$G_{dB,max} = G_{dB}(1) = H_0$$