

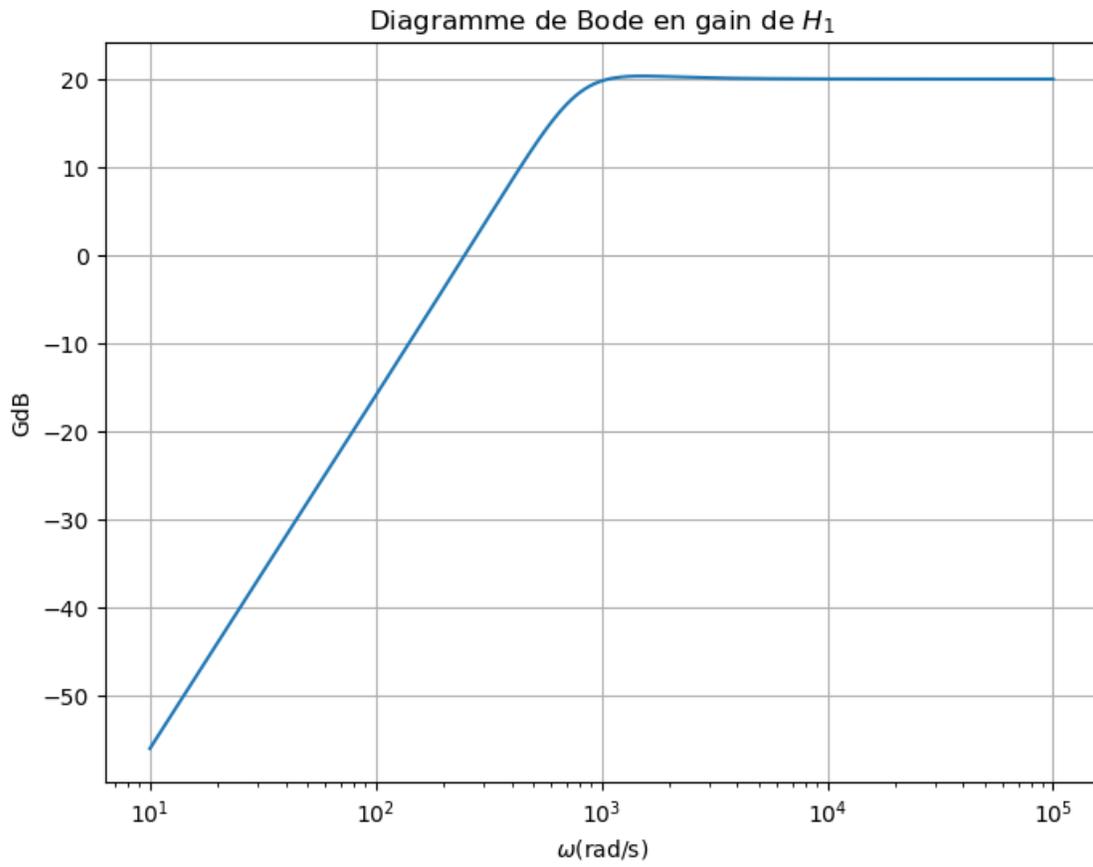
Filtre à structure de Rauch

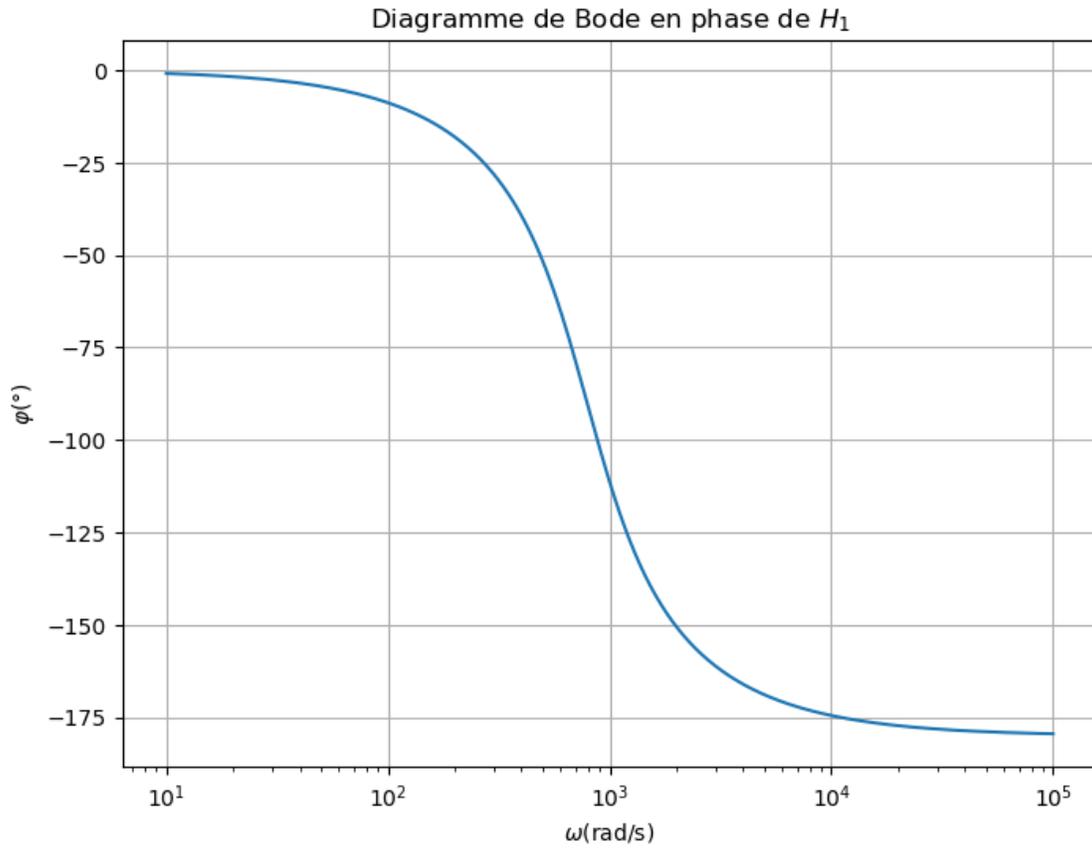
```
[1]: import numpy as np
import matplotlib.pyplot as plt
```

```
[2]: def H_Rauch_(Z1,Z2,Z3,Z4,Z5):
    A_=np.array([[1/Z1+1/Z2+1/Z3+1/Z4,-1/Z3,-1/Z4],[-1/Z3,1/Z3+1/Z5,-1/
↪Z5],[0,1,0]])
    B_=np.array([1/Z1,0,0])
    x_=np.linalg.solve(A_,B_)
    return x_[2]
```

```
[3]: C=220e-9
C4=22e-9
R2=3.3e3
R5=1e5
def H1_(w):
    Z1=1/(1j*C*w)
    Z2=R2
    Z3=Z1
    Z4=1/(1j*C4*w)
    Z5=R5
    return H_Rauch_(Z1,Z2,Z3,Z4,Z5)
tab_w=np.logspace(1,5,1000)
tab_H1_[H1_(w) for w in tab_w]
tab_GdB1=20*np.log10(np.abs(tab_H1_))
tab_phase1=np.angle(tab_H1_)
plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_GdB1)
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel("GdB")
plt.grid()
plt.title(r"Diagramme de Bode en gain de $H_1$")
plt.show()
plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_phase1*180/np.pi)
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel(r"$\varphi$(°)")
```

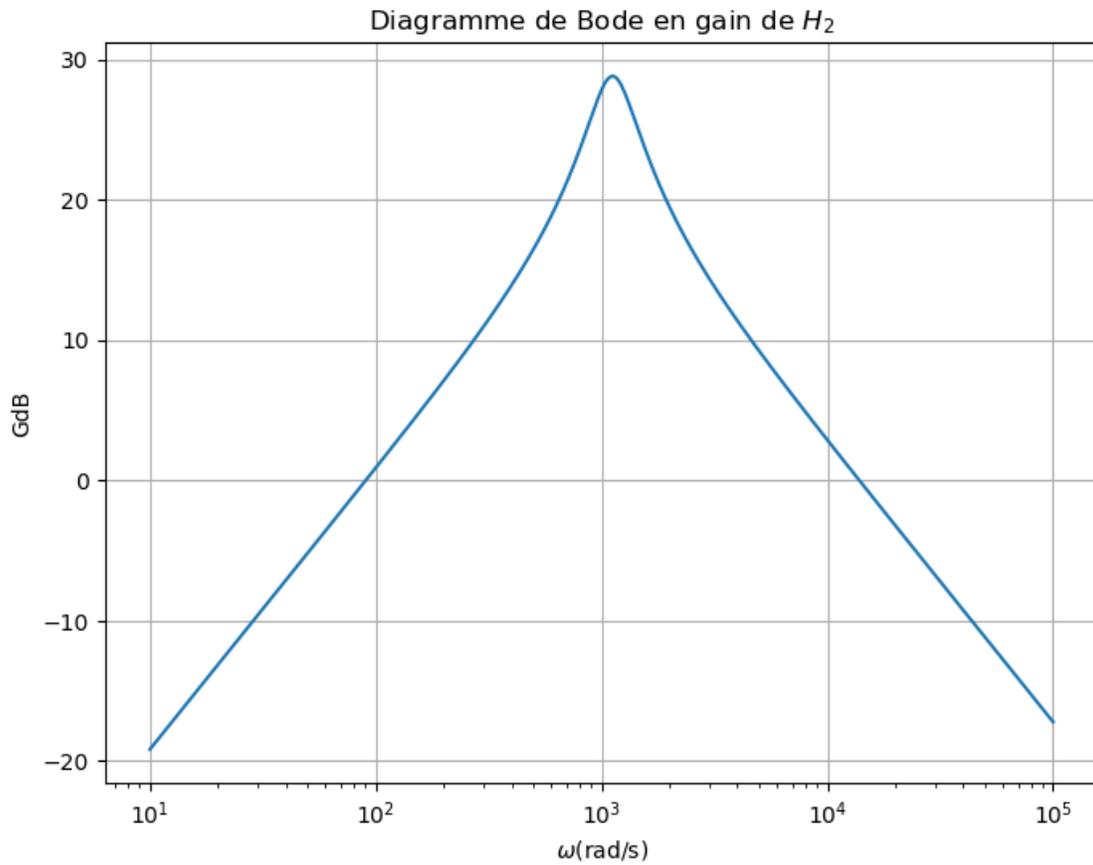
```
plt.grid()  
plt.title(r"Diagramme de Bode en phase de $H_1$")  
plt.show()
```

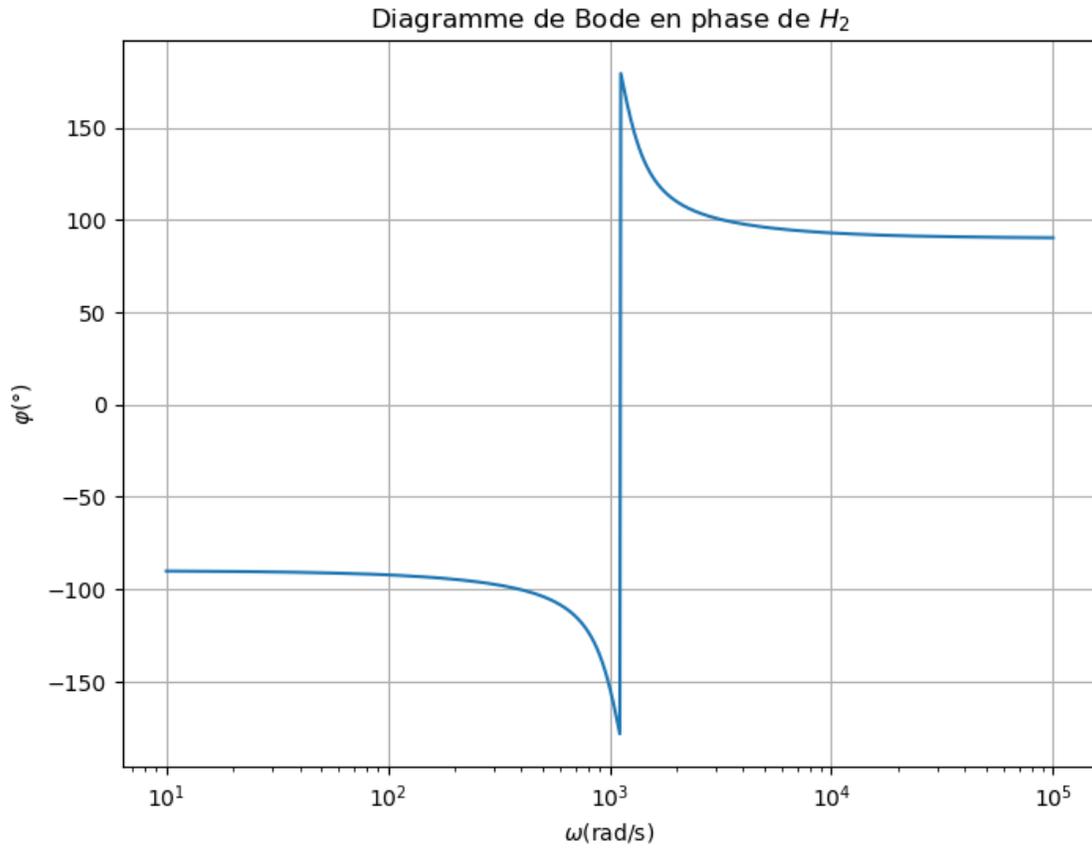




```
[4]: def H2_(w):
    Z1=R2
    Z2=R2
    Z3=1/(1j*C*w)
    Z4=1/(1j*C4*w)
    Z5=R5
    return H_Rauch_(Z1,Z2,Z3,Z4,Z5)
tab_w=np.logspace(1,5,1000)
tab_H2_=[H2_(w) for w in tab_w]
tab_GdB2=20*np.log10(np.abs(tab_H2_))
tab_phase2=np.angle(tab_H2_)
plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_GdB2)
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel("GdB")
plt.grid()
plt.title(r"Diagramme de Bode en gain de $H_2$")
plt.show()
```

```
plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_phase2*180/np.pi)
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel(r"$\varphi$(°)")
plt.grid()
plt.title(r"Diagramme de Bode en phase de $H_2$")
plt.show()
```





```
[9]: def H_Rauch_gainfini_(Z1,Z2,Z3,Z4,Z5,w):
    H0,w0=1e5,1
    A_=np.array([[1/Z1+1/Z2+1/Z3+1/Z4,-1/Z3,-1/Z4],[-1/Z3,1/Z3+1/Z5,-1/
↪Z5],[0,H0/(1+1j*w/w0),1]])
    B_=np.array([1/Z1,0,0])
    x_=np.linalg.solve(A_,B_)
    return x_[2]
```

```
[10]: def H2_gainfini_(w):
    Z1=R2
    Z2=R2
    Z3=1/(1j*C*w)
    Z4=1/(1j*C4*w)
    Z5=R5
    return H_Rauch_gainfini_(Z1,Z2,Z3,Z4,Z5,w)
tab_w=np.logspace(1,5,1000)
tab_H2gf_[H2_gainfini_(w) for w in tab_w]
tab_GdB2gf=20*np.log10(np.abs(tab_H2gf_))
tab_phase2gf=np.angle(tab_H2gf_)
```

```

plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_GdB2,label="AO idéal")
plt.plot(tab_w,tab_GdB2gf,label="gain fini")
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel("GdB")
plt.grid()
plt.title(r"Diagramme de Bode en gain de $H_2$")
plt.legend()
plt.show()
plt.figure(figsize=(8,6))
plt.plot(tab_w,tab_phase2*180/np.pi,label="AO idéal")
plt.plot(tab_w,tab_phase2gf*180/np.pi,label="gain fini")
plt.xscale("log")
plt.xlabel(r"$\omega$(rad/s)")
plt.ylabel(r"$\varphi$(°)")
plt.grid()
plt.title(r"Diagramme de Bode en phase de $H_2$")
plt.legend()
plt.show()

```

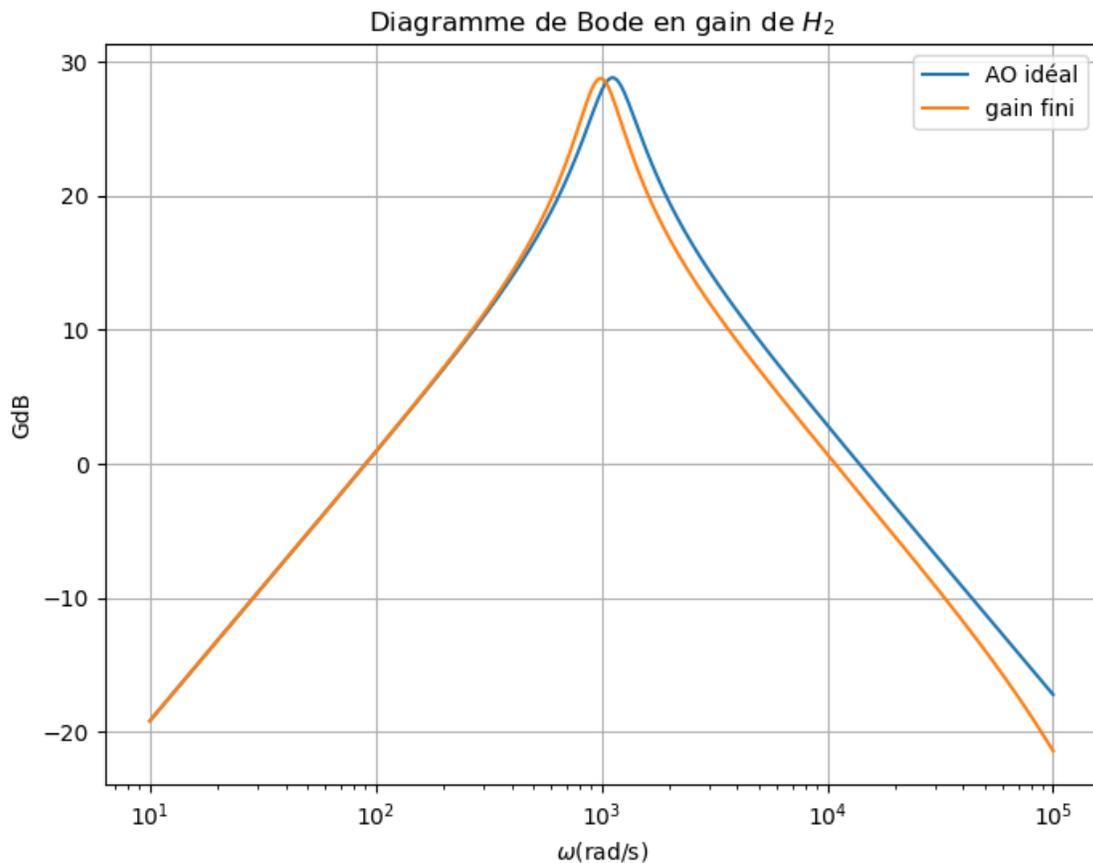
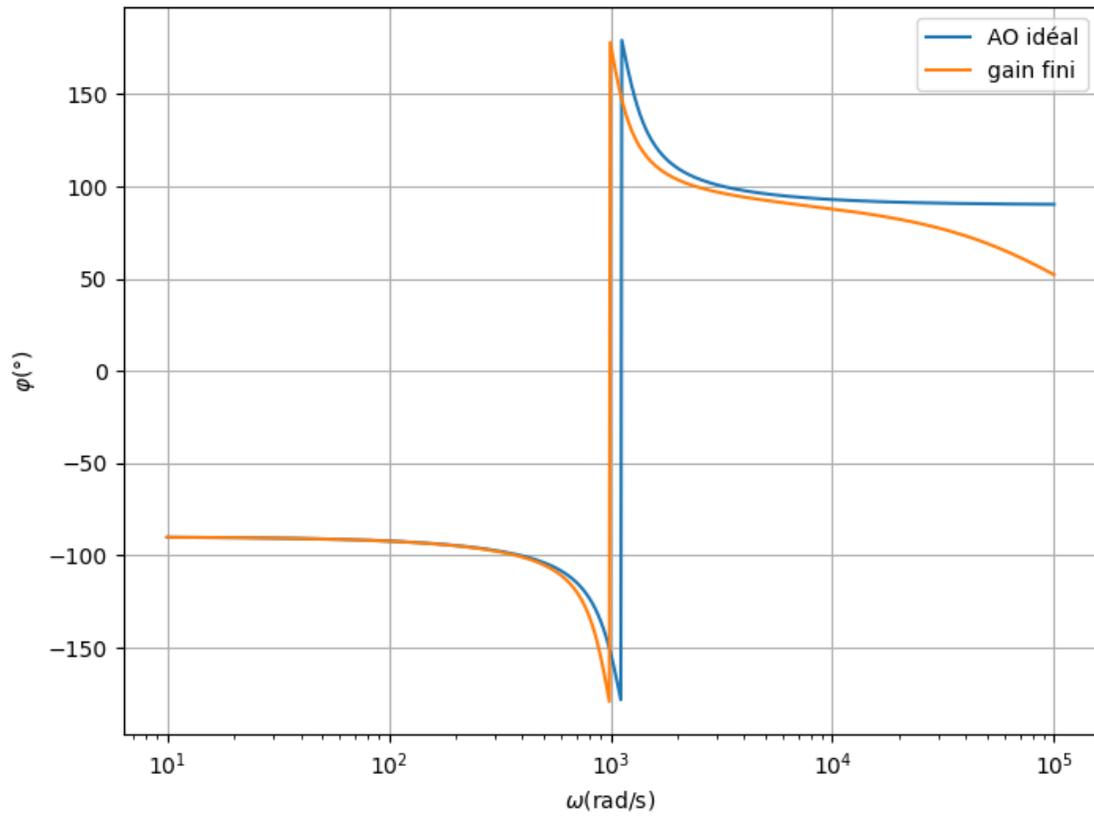


Diagramme de Bode en phase de H_2



[]:

[]: