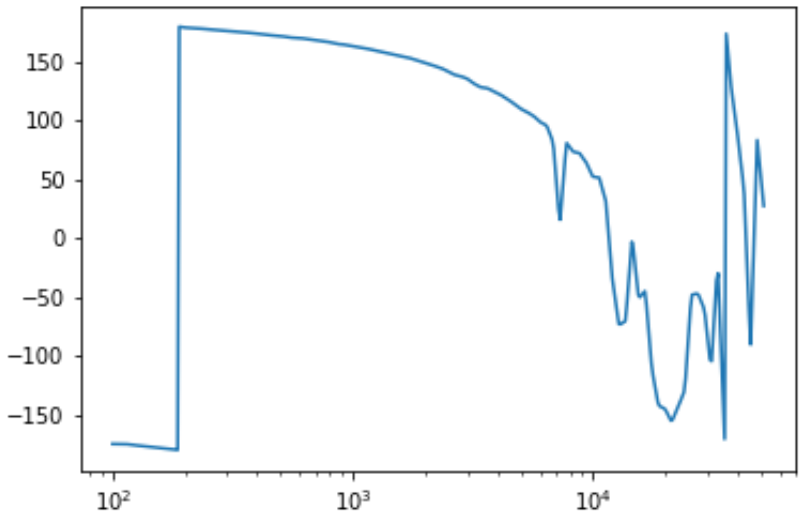
In [40]:
```
import numpy as np
import matplotlib.pyplot as plt

#%matplotlib
```

In [41]:
```
f=np.logspace(2,4.70926996098,401)
m=np.loadtxt(open("/Users/ihong/desktop/transfer function/fli/MC.TXT",'rb'))
p=np.loadtxt(open("/Users/ihong/desktop/transfer function/fli/MC2.TXT",'rb'))

re = m*np.cos(p/180*np.pi)
im = m*np.sin(p/180*np.pi)

c = re+im*1j

c1 =m*np.exp(p/180*np.pi*1j)
```

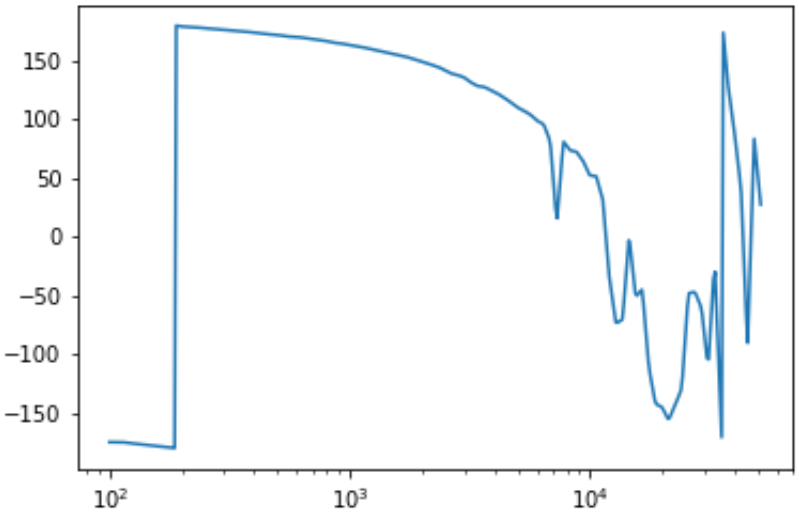
In [42]:
```
plt.semilogx(f, np.angle(c)/np.pi*180)
```

Out[42]:
```
[<matplotlib.lines.Line2D at 0x1c21823358>]
```



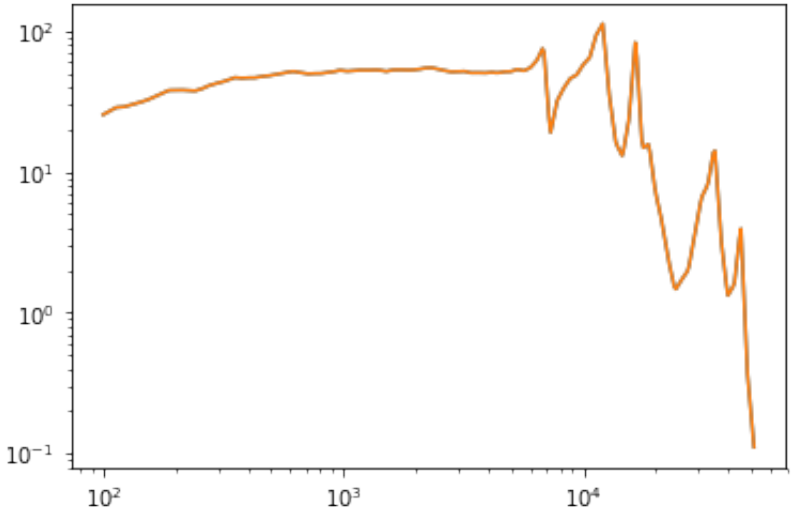
In [43]:
```
plt.semilogx(f, p)
```

Out[43]:
```
[<matplotlib.lines.Line2D at 0x1c219a1a90>]
```



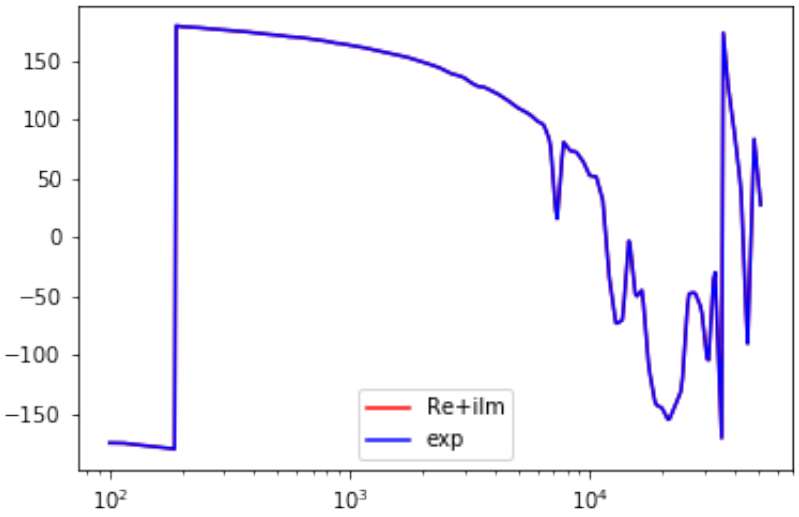
In [44]:
```
plt.loglog(f,np.abs(c),f,np.abs(c1))
```

Out[44]:
```
[<matplotlib.lines.Line2D at 0x1c21791be0>,
 <matplotlib.lines.Line2D at 0x1c2172d5f8>]
```

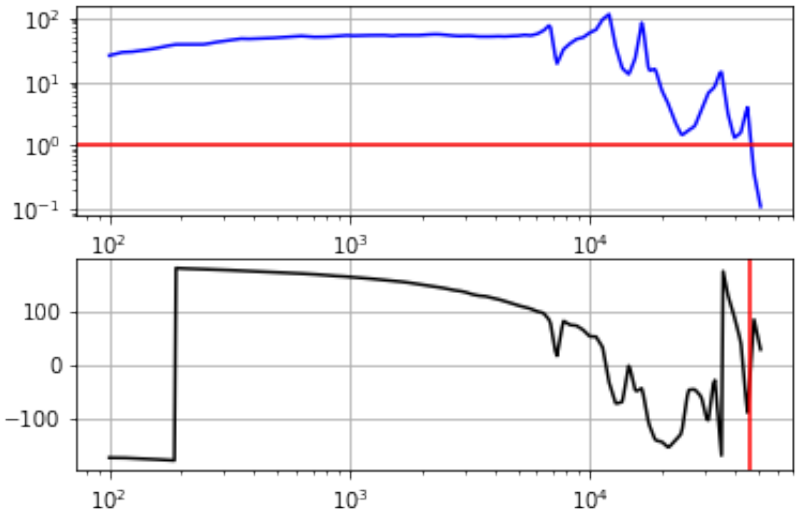


In [45]:
```
plt.semilogx(f,np.angle(c)*180/np.pi,'r',label = 'Re+iIm')
plt.semilogx(f,np.angle(c1)*180/np.pi,'b', label = 'exp')
plt.legend()
```

Out[45]: <matplotlib.legend.Legend at 0x1c202da358>



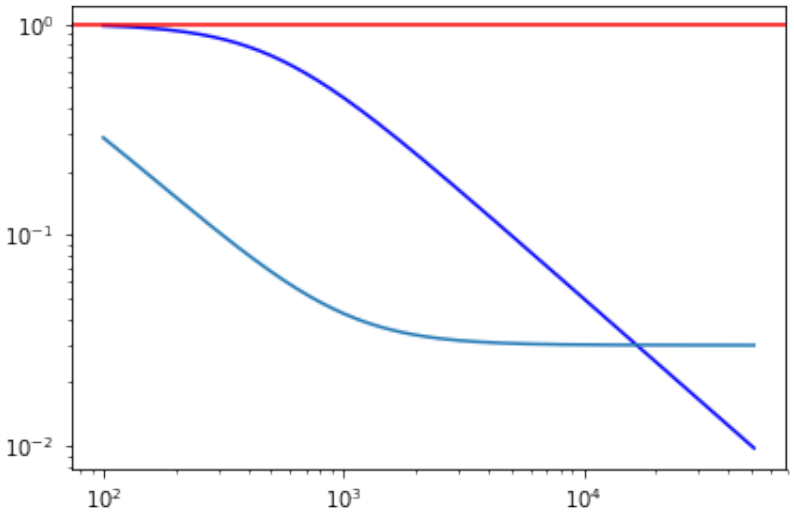
In [46]:
```
plt.subplot(2,1,1)
plt.loglog(f, m, 'b')
index = (np.abs(m-1)).argmin()
plt.axhline(y = 1 , color = 'r', linestyle = '-')
plt.grid()

plt.subplot(2,1,2)
plt.semilogx(f, p, 'k')
plt.axvline(x = f[index], color = 'r', linestyle = '-')
plt.grid()

plt.show()
```



In [100]:
```
f1 = 500 #the pole frequency where you want to put 1-order low-pass
filter
#to = 1/(2*np.pi*frequency)
#lowpass1 = 1/np.sqrt(1+(2*np.pi*f*to)**2)*np.exp(1j*np.arctan(2*np
.pi*f*to))
lowpass = 1/(1+1j*f/f1)

f2 = 30 #the pole frequency where you want to put 1-order low-pass
filter
#toi = 1/(2*np.pi*frequencyi)
#inter = 1/np.sqrt(1+(2*np.pi*f*toi)**2)*np.exp(1j*np.arctan(2*np.p
i*f*toi))

f3 = 1000 #the zero frequency
#toh = 1/(2*np.pi*frequencyh)
inter = (1+1j*f/f3)*(1/(1+1j*f/f2))

gain = 2 #the gain you want to give
```

In [101]:
```
plt.loglog(f, np.abs(lowpass), 'b')
plt.loglog(f, np.abs(inter))
#plt.loglog(f, np.abs(inter*highpass))
plt.axhline(y = 1 , color = 'r', linestyle = '-')
```

Out[101]: <matplotlib.lines.Line2D at 0x1c23501668>



In [117]:
```
plt.figure(figsize=(10,6))

plt.subplot(2,1,1)
plt.loglog(f, np.abs(c*gain*lowpass*inter), 'b')
index = (np.abs(np.abs(c*gain*lowpass*inter)-1)).argmin()
plt.axhline(y = 1 , color = 'r', linestyle = '-')
plt.text(180, 0.005, 'Unity gain frequency = {} Hz'.format(np.int(f
[index])), style='italic',
        bbox={'facecolor':'white', 'alpha':0.5, 'pad':10})
plt.grid()

plt.subplot(2,1,2)
plt.semilogx(f, np.angle(c*gain*lowpass*inter)/np.pi*180, 'k')
plt.axvline(x = f[index], color = 'r', linestyle = '-')

Pm = np.angle(c*gain*lowpass*inter)/np.pi*180
plt.text(180, -100, 'Phase margin = {}'.format(np.int(Pm[index])),
style='italic',
        bbox={'facecolor':'white', 'alpha':0.5, 'pad':10})

plt.grid()

#plt.show()
plt.savefig('name.png')
```