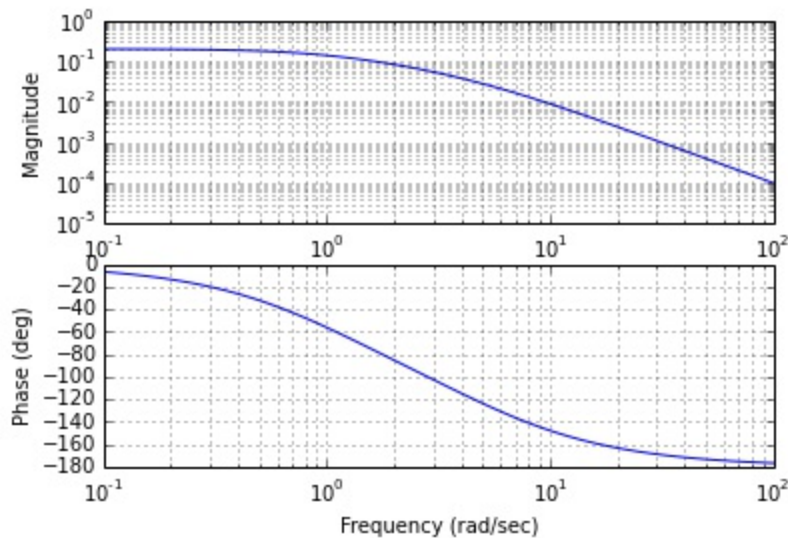


Python 2.7.6 (default, Jan 11 2014, 14:34:26)  
Type "copyright", "credits" or "license" for more information.

IPython 0.13.2 -- An enhanced Interactive Python.  
? -> Introduction and overview of IPython's features.  
%quickref -> Quick reference.  
help -> Python's own help system.  
object? -> Details about 'object', use 'object??' for extra details.  
%gui? -> A brief reference about the graphical user interface.

Welcome to pylab, a matplotlib-based Python environment [backend:  
module://IPython.zmq.pylab.backend\_inline].  
For more information, type 'help(pylab)'.

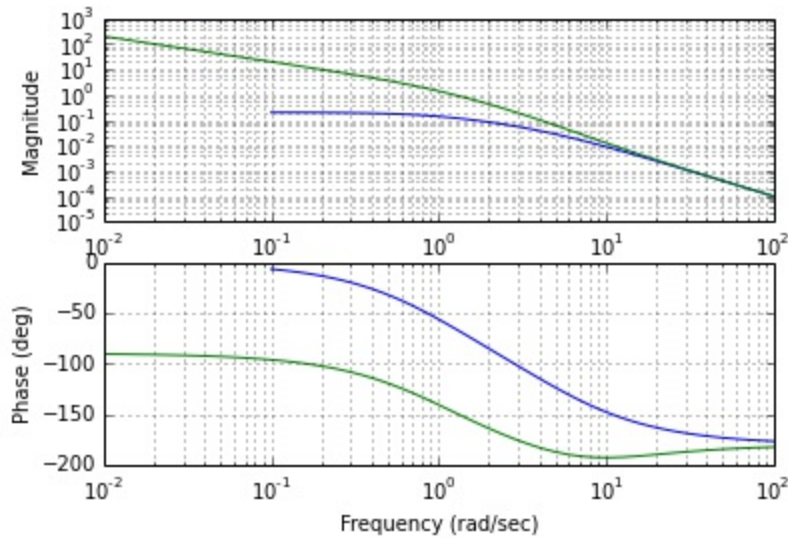
```
In [1]: from yottalab import *
...: from control import *
...: from control.xferfcn import *
...: from numpy import pi
...: from scipy import sin, sqrt
...:
...: g=tf([1],[1,6,5])
...: bode(g);
...: show()
...:
```



```
In [2]: wgc = 10          # Desired Bandwidth
...: desiredPM = 60     # Desired Phase margin
...: # PI part
...: Ti=0.1
...: Gpi=tf([Ti,1],[Ti,0])
...: print "PI part is: ", Gpi
...: figure()
...: bode(g);
...: hold
...: bode(Gpi*g);
...: show()
...:
```

PI part is:

```
0.1 s + 1
-----
0.1 s
```



```
In [3]: mag,phase,omega = bode(Gpi*g,[wgc],Plot=False)
...: ph = phase[0]
...: if ph>=0:
...:     ph = phase[0]-360;
...:
...: Phase = -180+desiredPM
...: dPM = Phase-ph
...: print "Additional phase from Lead part: ", dPM
...:
```

Additional phase from Lead part: 72.7243556854

```
In [4]: # Lead art
...: dPMrad = dPM/180*pi
...: alfa = (1+sin(dPMrad))/(1-sin(dPMrad));
...: print "Alpha is: ", alfa
...:
```

Alpha is: 43.3332403246

In [4]:

```
In [5]: Tlead = 1/(sqrt(alfa)*wgc);
...: Glead = tf([alfa*Tlead,1],[Tlead,1])
...: print "Lead part is: ", Glead
...:
```

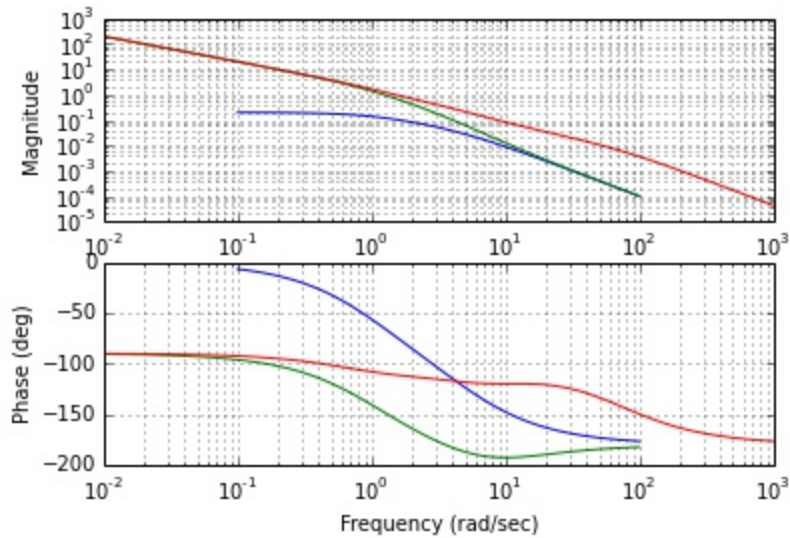
```
Lead part is:
0.6583 s + 1
-----
0.01519 s + 1
```

```
In [6]: figure()
...: bode(g);
...: hold
```

```

...: bode(Gpi*g);
...: bode(Gpi*Glead*g);
...: show()
...:

```



```

In [7]: mag,phase,omega = bode(Gpi*Glead*g,[wgc],Plot=False)
...: print "Phase at wgc is: ", phase[0]
...: K=1/mag[0]
...: print "Gain to have MAG at gwc 0dB: ", K
...:

```

```

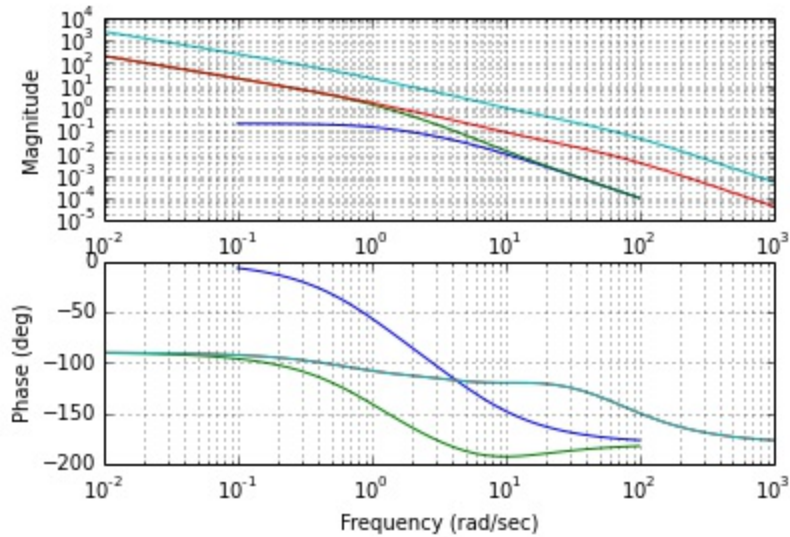
Phase at wgc is: -120.0
Gain to have MAG at gwc 0dB: 12.0695231716

```

```

In [8]: figure()
...: bode(g);
...: hold
...: bode(Gpi*g);
...: bode(Gpi*Glead*g);
...: bode(K*Gpi*Glead*g);
...:

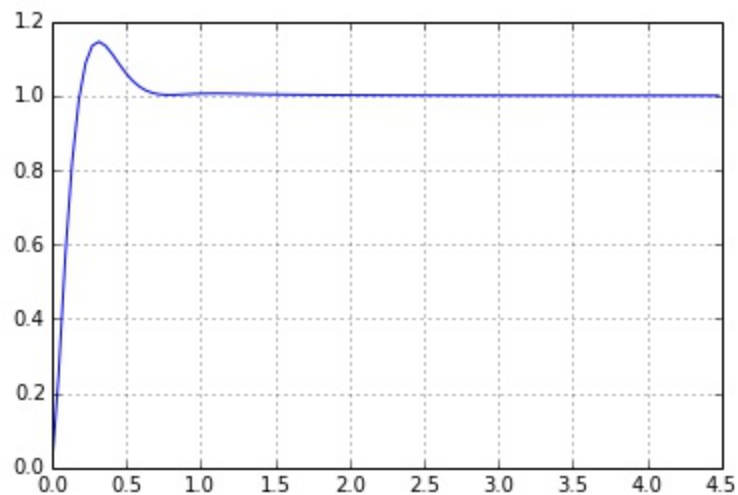
```



```
In [9]: print "Full controller: ", K*Gpi*Glead
Full controller:
0.7945 s^2 + 9.152 s + 12.07
-----
0.001519 s^2 + 0.1 s
```

```
In [10]: mag,phase,omega = bode(K*Gpi*Glead*g,[wgc],Plot=False)
...: print "Data at wgc - wgc: ", omega[0], "Magnitude: ",mag[0], "Phase: ",phase[0]
...:
Data at wgc - wgc: 10 Magnitude: 1.0 Phase: -120.0
```

```
In [11]: gt=feedback(K*Gpi*Glead*g,1)
...: y,t = step(gt)
...: figure()
...: plot(t,y)
...: grid()
...: show()
...:
```



In [12]: