bodas

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`bodas` is used to draw the asymptotic Bode plots (magnitude and phase) of a system with the following form:

$$G(s) = \frac{\text{num}(s)}{\text{den}(s)}$$

where num(s) and den(s) are polynomials.

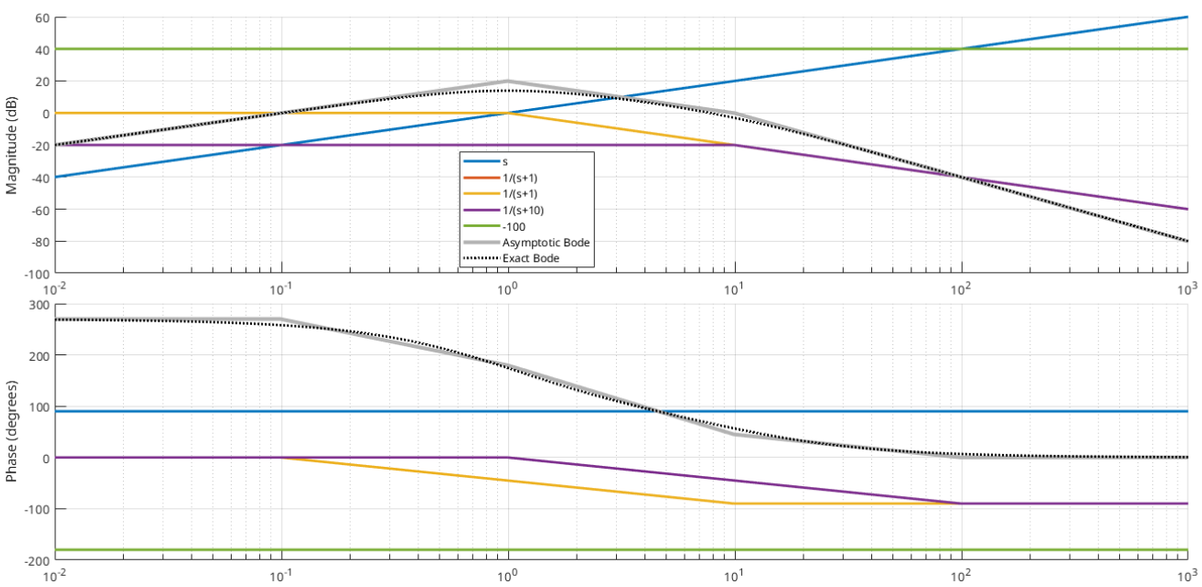
For example, we want draw the asymptotic Bode plots of the following system:

$$G(s) = \frac{-100s}{s^2 + 12s^2 + 21s + 10}$$

To draw the asymptotic Bode plot, the MATLAB codes are as follows:

```
s = tf('s');
G = -100*s / (s^3 + 12*s^2 + 21*s + 10)
[G, w] = bodas(G);
```

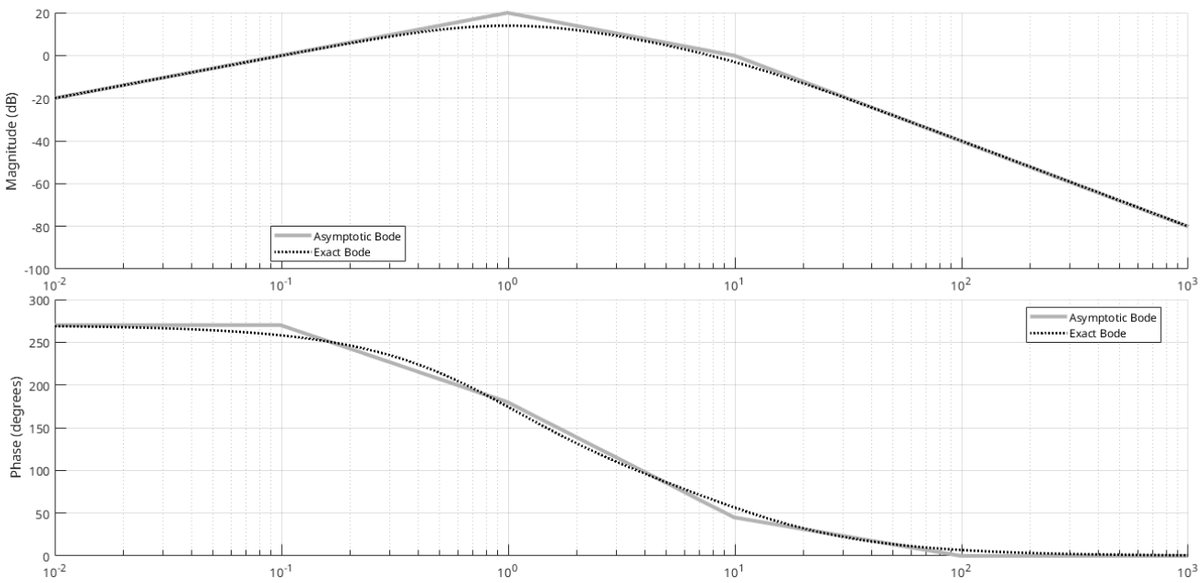
The result is as follows:
The individual plots:



Here, we can see the transfer function that we gave to Bodas are automatically expanded into products of five simpler transfer functions:

$$G(s) = \underbrace{(s)}_{G_1}\underbrace{\left(\frac{1}{s+1}\right)}_{G_2}\underbrace{\left(\frac{1}{s+1}\right)}_{G_3}\underbrace{\left(\frac{1}{s+10}\right)}_{G_4}\underbrace{(-100)}_{G_5}$$

The final result plots:



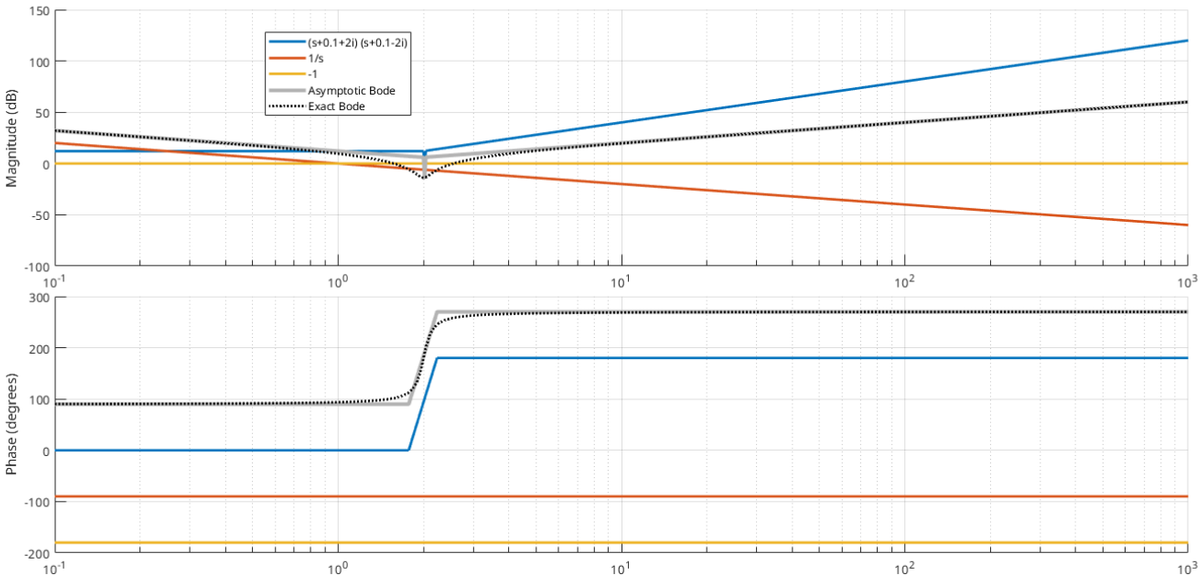
Now, let us try a system with complex conjugate poles/zeros. For such a system, we only need to include one of the two poles/zeros.

$$G(s) = \frac{-s^2 - 0.2s - 4.01}{s}$$

To draw the asymptotic Bode plot, the MATLAB codes are as follows:

```
s = tf('s');
G = (-s^2-0.2*s-4.01) / s
[G, w] = bodas(G);
```

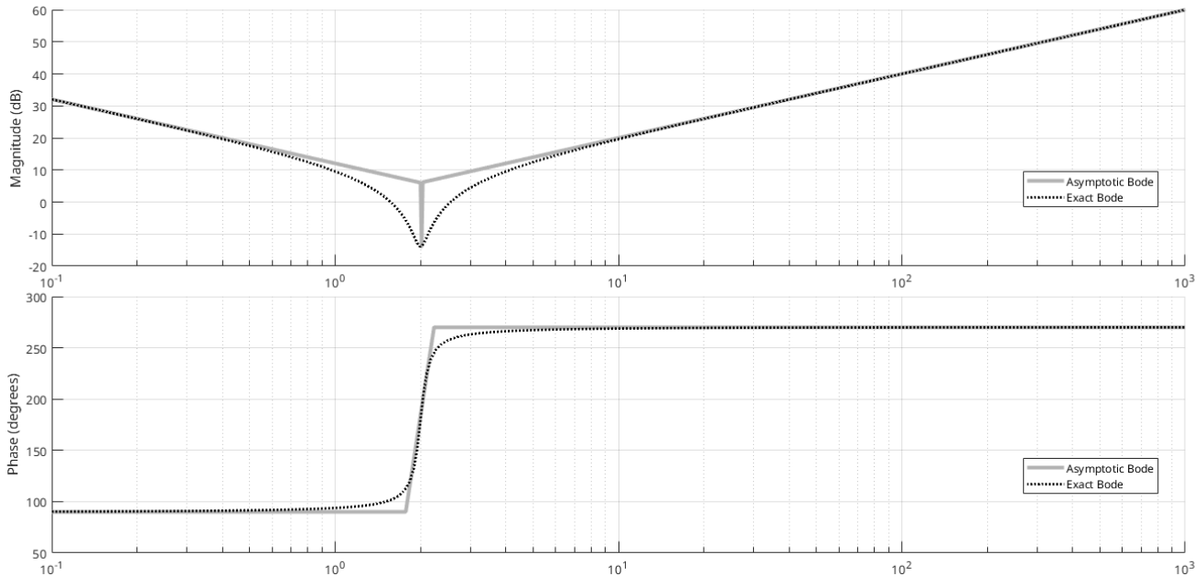
The result are as follows.
The individual plots:



Here, we can see the transfer function that we gave to Bodas are automatically expanded into products of three simpler transfer functions:

$$G(s) = \underbrace{(s+0.1+2i)(s+0.1-2i)}_{G_1} \underbrace{\left(\frac{1}{s}\right)}_{G_2} \underbrace{(-1)}_{G_3}$$

The final result plots:


Magnitude (dB)
Asymptotic Bode
Exact Bode

Phase (degrees)
Asymptotic Bode
Exact Bode