bodas

Auralius Manurung
School of Electrical Engineering Telkom University
auralius.manurung@ieee.org

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

$$G(s) = K\frac{(s+z_1)(s+z_2)\dots(s+c_1)(s+\bar{c}_1)(s+c_2)(s+\bar{c}_2)\dots}{(s+p_1)(s+p_2)\dots(s+d_1)(s+\bar{d}_1)(s+d_1)(s+\bar{d}_1)\dots}$$

where: $K,\ z, p \in \mathbb{R}$ and $c, d \in \mathbb{C}$.

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

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

First, we modify $G(s)$ as follows:

$$G(s) = -100\ \frac{(s+0)}{(s+1)(s+1)(s+10)}$$

Next, we collect z, p, and K, as follows:

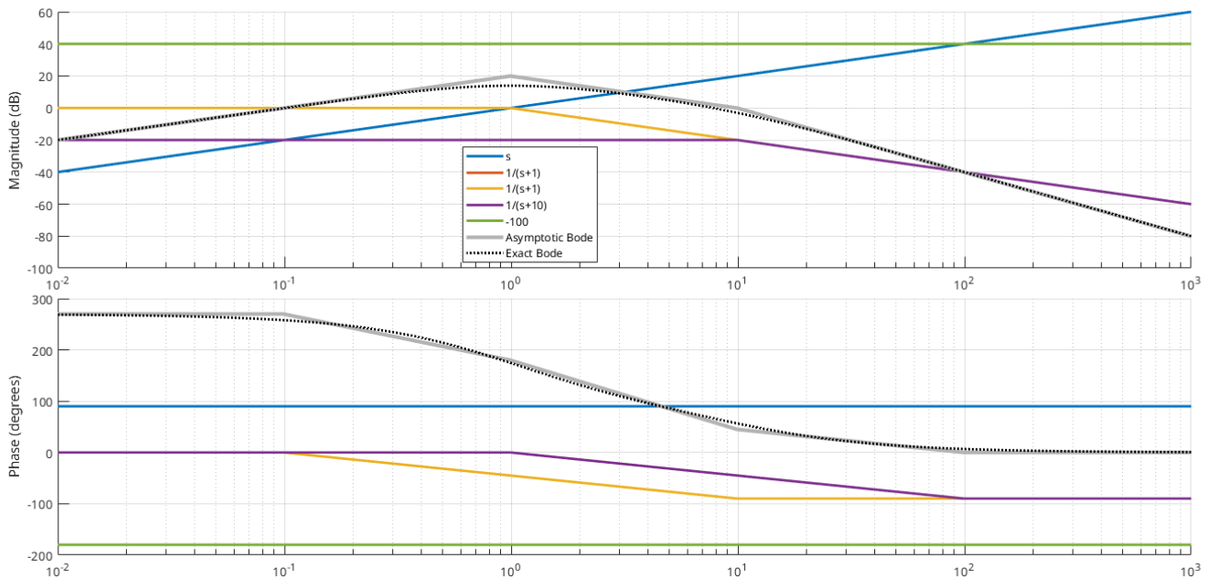
```
z = [0];
p = [1 1 10];
K = -100;
```

To draw the asymptotic Bode plot, we simply use:

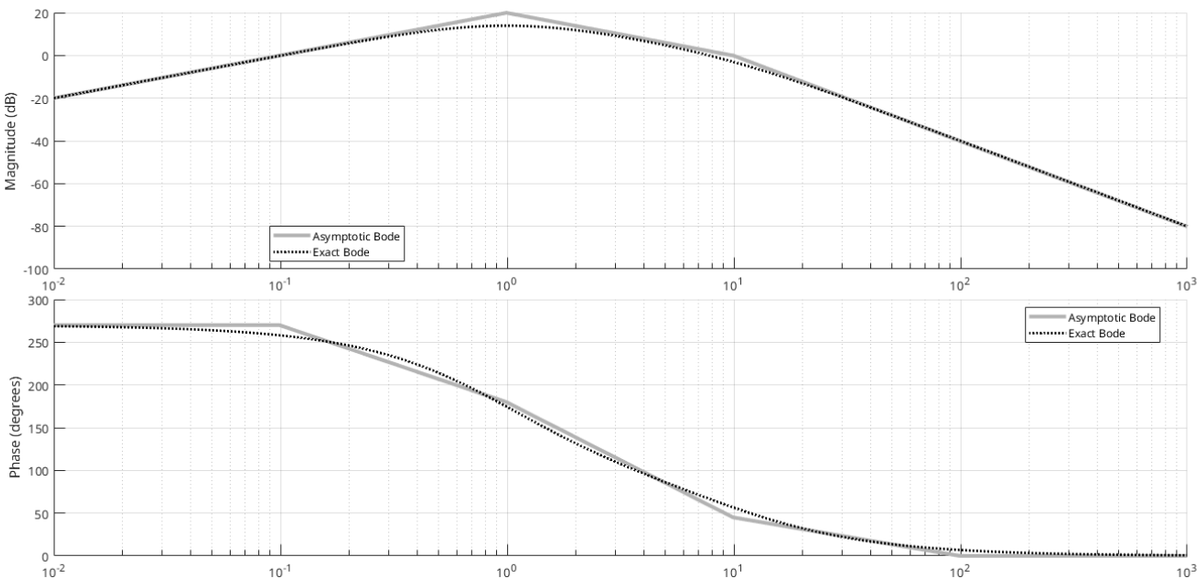
```
bodas(z,p,K);
```

The result is as follows:

<u>The individual plots:</u>



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.

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

We then decompose $G(s)$ into the following form:

$$G(s) = \underbrace{(-1)}_{\text{Gain}} \frac{\overbrace{(s+0.1+2i)(s+0.1-2i)}^{\text{one pair of complex-conjugate zeros}}}{\underbrace{(s+0)}_{\text{one pole at the origin}}}$$

Next, we collect z, p, and K, as follows:

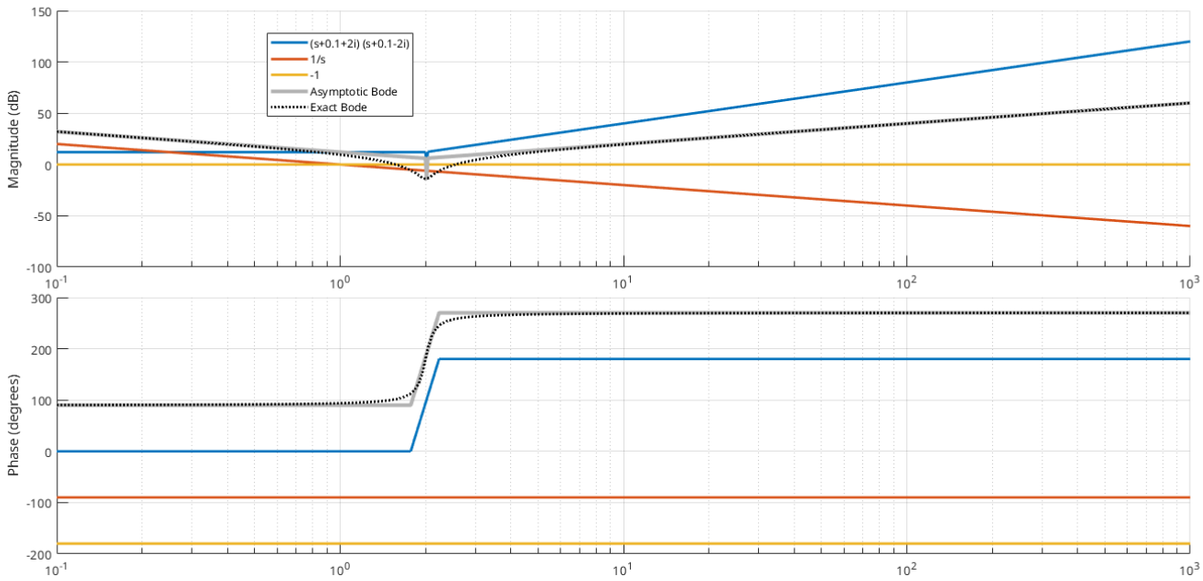
```
z = [0,1+2i]; %only need to put one of the complex zeros!
p = [0];
K = -1;
```

To draw the asymptotic Bode plot, we simply use:

```
bodas(z,p,K);
```

The result are as follows.

The individual plots:



The final result plots: