

Home Work 1

Author: Leul Shiferaw

March 20, 2017

1 Task 1

1.1 Deriving $G(j\omega)$

We start by representing the elements as in their Laplace Transform then apply voltage divider.

$$\begin{aligned}V_{out} &= V_{in} \frac{R}{\frac{1}{sC} + R} \\&= V_{in} \frac{sRC}{1 + sRC} \\G(s) &= \frac{V_{out}}{V_{in}} \\&= \frac{sRC}{1 + sRC} \\G(j\omega) &= \frac{j\omega RC}{1 + j\omega RC}\end{aligned}$$

1.2 Matlab Code

1.2.1 True Plot

2 Task 2

2.1 Deriving $G(j\omega)$

We start by representing the elements in their Laplace Transform and then applying voltage divider.

```
Editor - /home/leulshiferaw/Desktop/GEN-IMS2/HW1/Task1.m
Task1.m x +
1 - close all;
2 - clear all;
3
4 - R=1e5;
5 - C=1;
6
7 - num=[R*C 0]
8 - den=[R*C 1]
9
10 - G=tf(num, den);
11 - bode(G);
12 - grid on;
```

Figure 1: Code for true plot

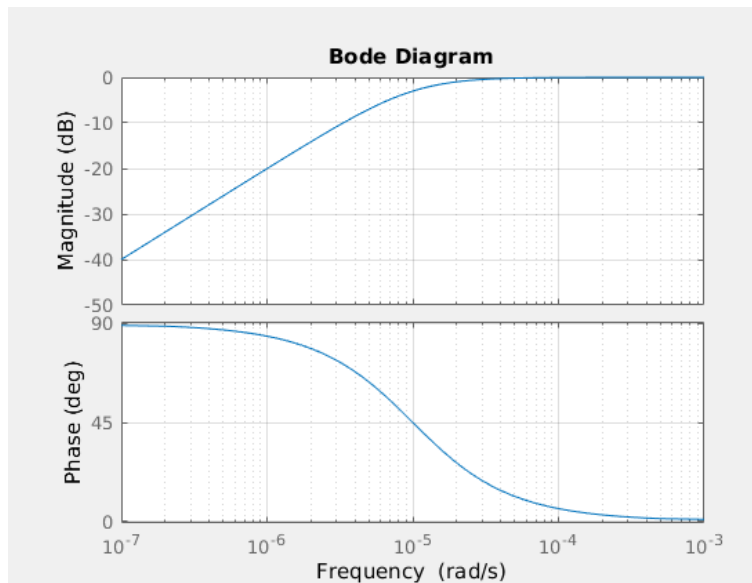
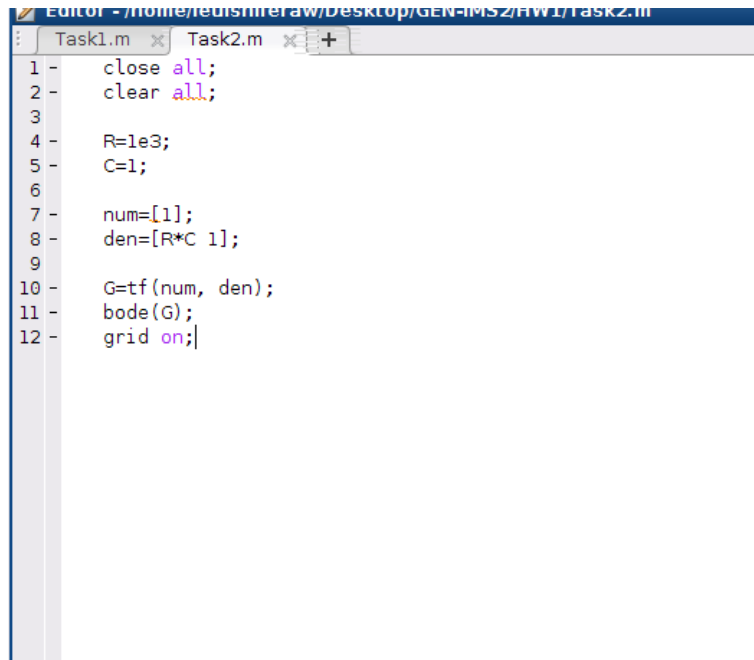


Figure 2: Bode plot for true plot

$$\begin{aligned}
V_{out} &= V_{in} \frac{\frac{1}{sC}}{\frac{1}{sC} + R} \\
&= V_{in} \frac{1}{1 + sRC} \\
G(s) &= \frac{V_{out}}{V_{in}} \\
&= \frac{1}{1 + sRC} \\
G(jw) &= \frac{1}{1 + jwRC}
\end{aligned}$$

2.2 Matlab Code

2.2.1 True Plot



```
Editor - /home/redisniraw/Desktop/GEN-MS2/HW1/Task2.m
Task1.m Task2.m
1 - close all;
2 - clear all;
3
4 - R=1e3;
5 - C=1;
6
7 - num=[1];
8 - den=[R*C 1];
9
10 - G=tf(num, den);
11 - bode(G);
12 - grid on;
```

Figure 3: Code for bode plot

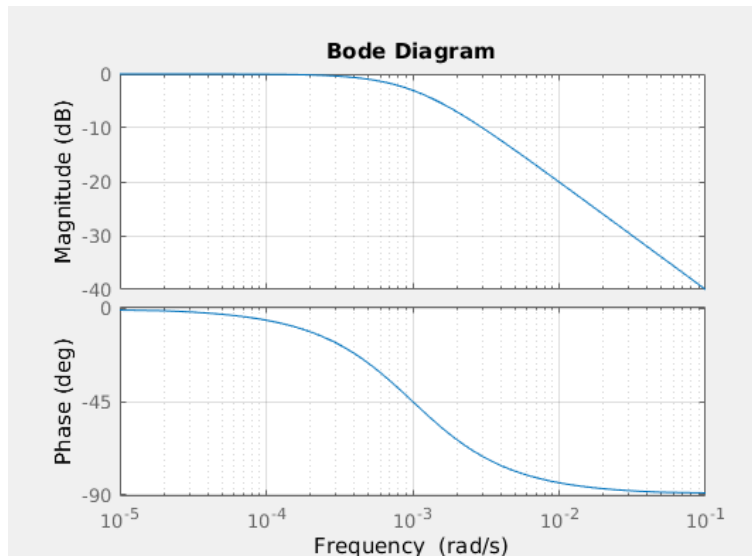


Figure 4: Bode plot

3 Task 3

3.1 Bode plots

3.1.1 A

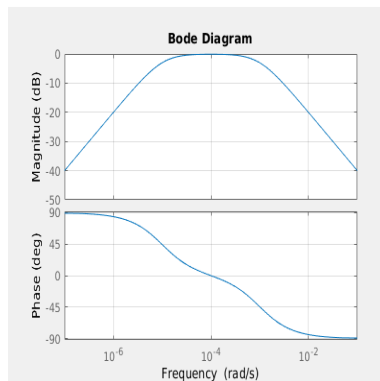


Figure 5: Bode plot for Task 3 a

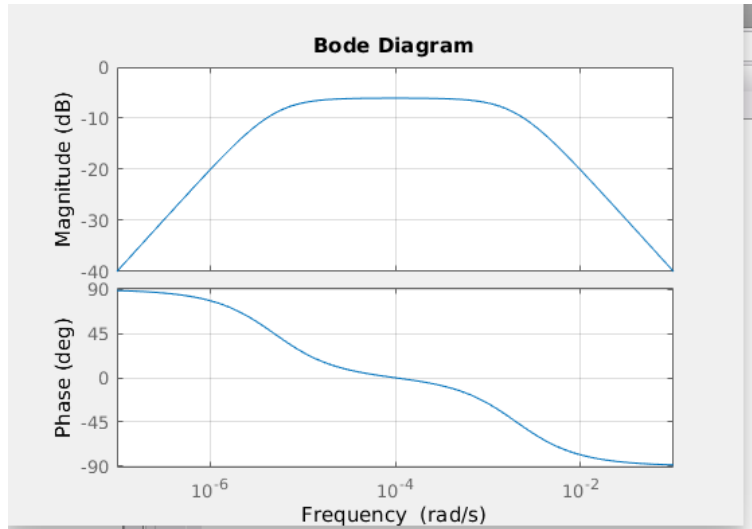


Figure 6: Bode plot Task 3 b

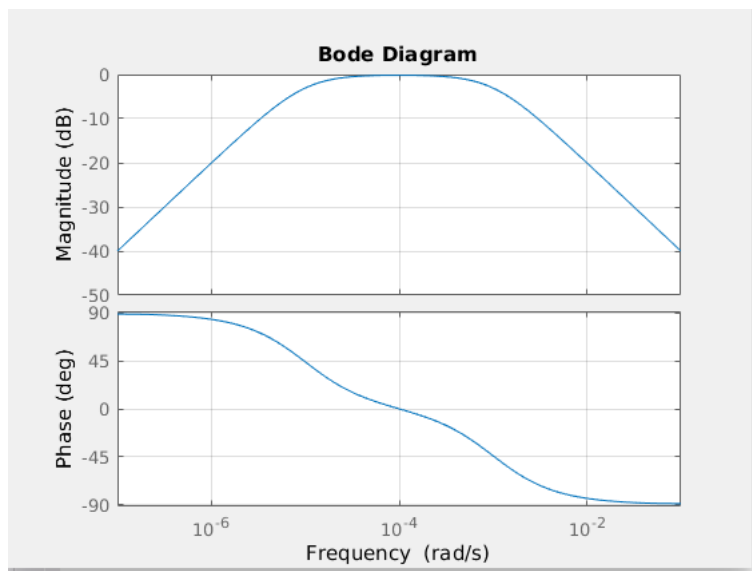


Figure 7: Bode plot Task 3 c