

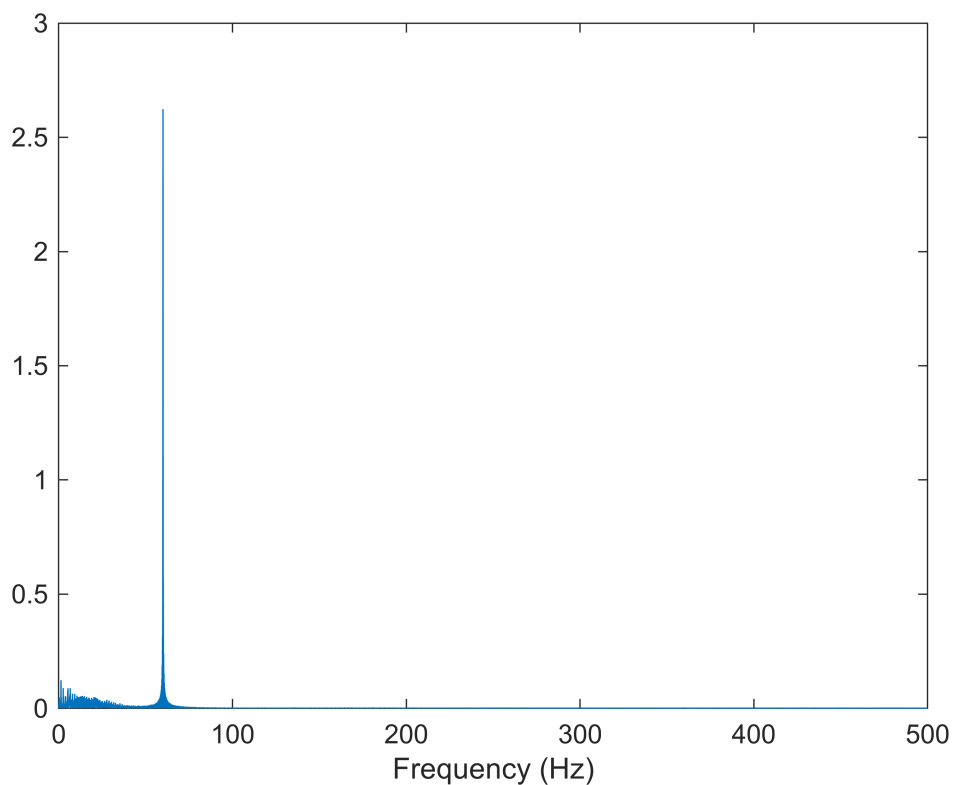
Leo Berman & Justin Ok Project 4 Code

Step 0

```
clear;  
data = load("ecg_data.txt");  
t = data(:,1);  
x = data(:,2);  
fs = 1000;
```

Step 1

```
myFFT(x,fs);
```



Step 2

RC Low Pass Filter

```
R = 6000;  
C = .000001;  
syms s  
Zr = R;  
Zc = 1/(s*C);  
Vin = 1;
```

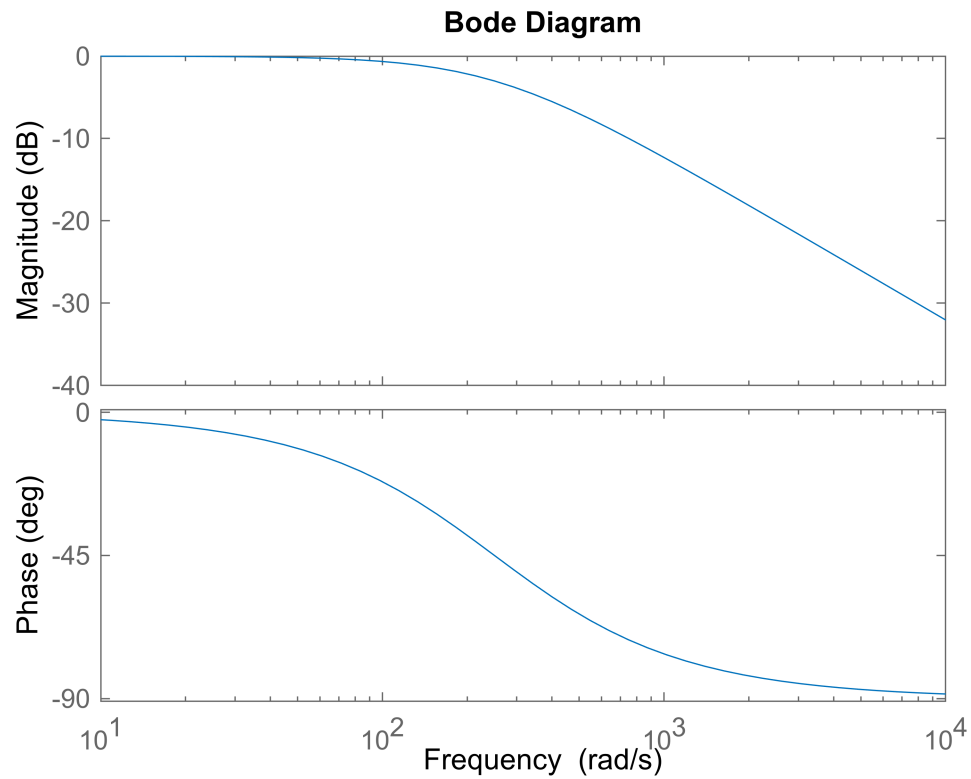
```
Vout = simplify(Vin*(Zc/(Zr+Zc)))
```

```
Vout =  

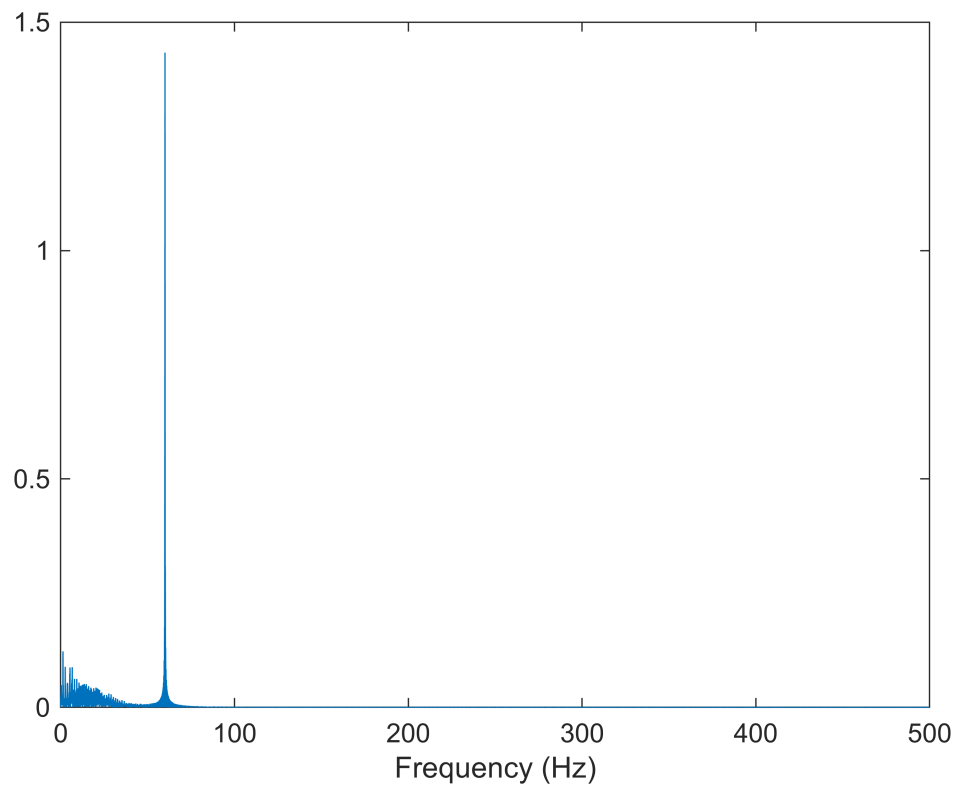
$$\frac{500}{3s + 500}$$

```

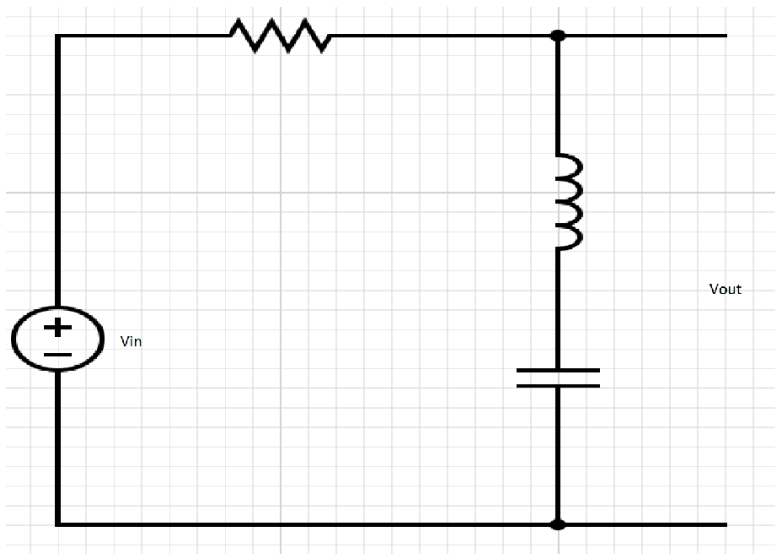
```
Hf = tf(1,[1/250 1]);  
bodeplot(Hf)
```



```
RCFilteredSignal = lsim(Hf,x,t);  
myFFT(RCFilteredSignal,fs)
```



RLC Band Stop Filter



```
R = 10000;  
L = .3;  
C = .0001;  
10*(1/C)
```

```
ans = 100000
```

```
syms s
Zr = R;
Zl = s*L;
Zc = 1/(C*s);
Vin = 1;
Vout = simplify((Vin*(Zl+Zc))/(Zr+Zl+Zc))
```

Vout =

$$\frac{3s^2 + 100000}{3s^2 + 100000s + 100000}$$

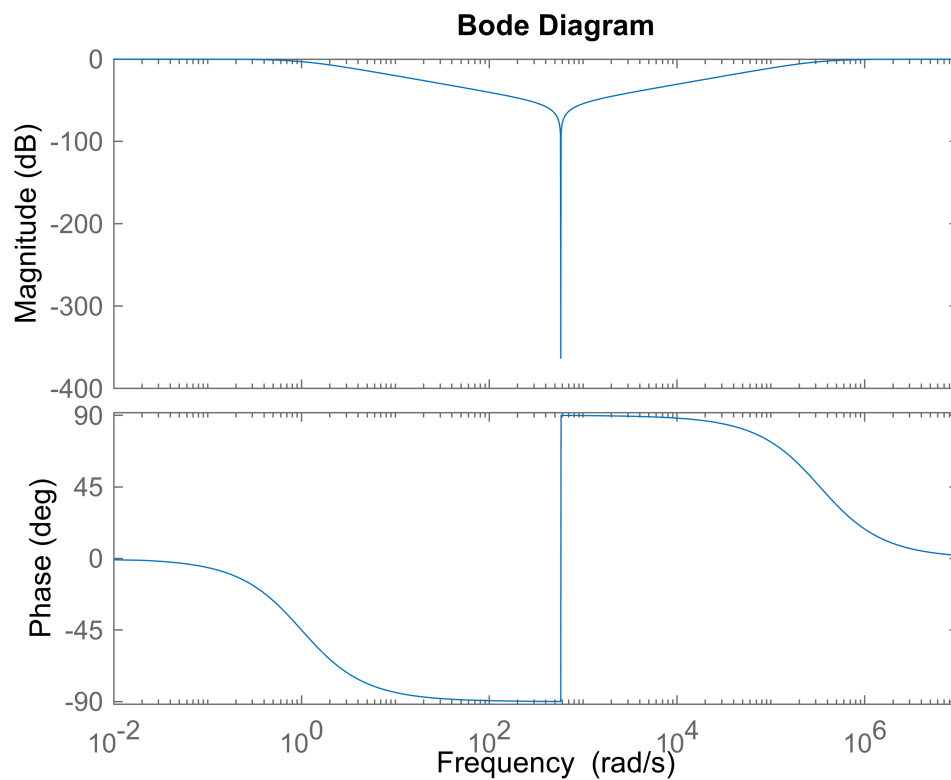
```
Hf = tf([L/(10*(1/C)) 0 1],[L/(10*(1/C)) (R*10)/(10*(1/C)) 1])
```

Hf =

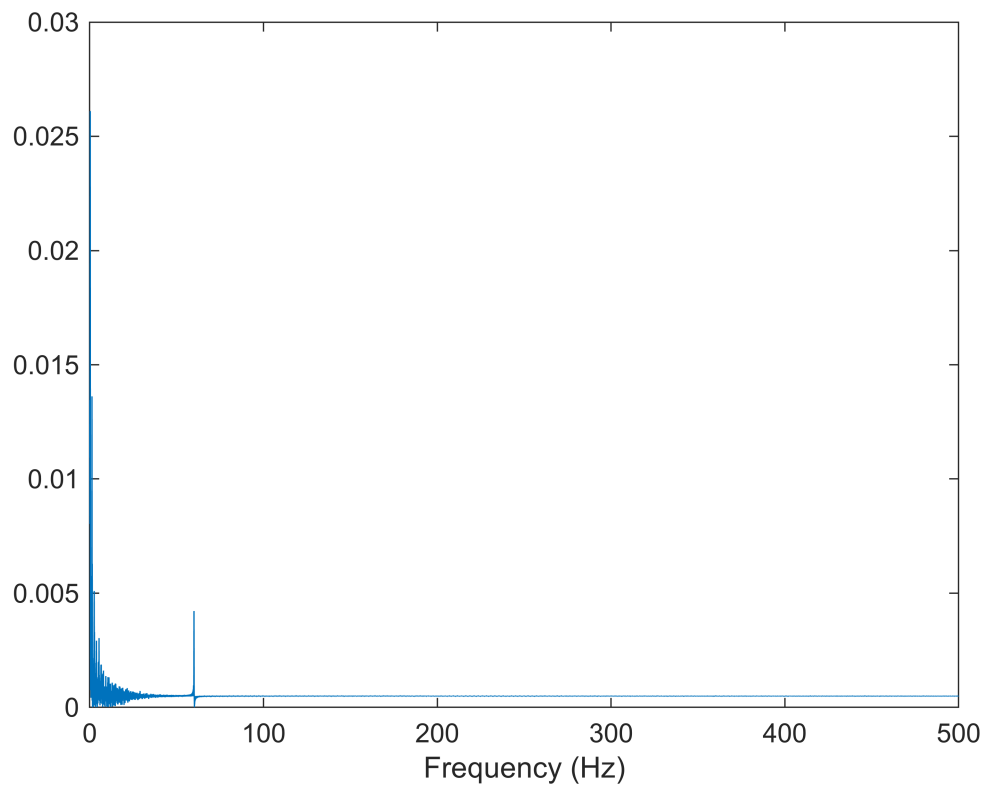
$$\frac{3e-06 s^2 + 1}{3e-06 s^2 + s + 1}$$

Continuous-time transfer function.

```
bodeplot(Hf)
```

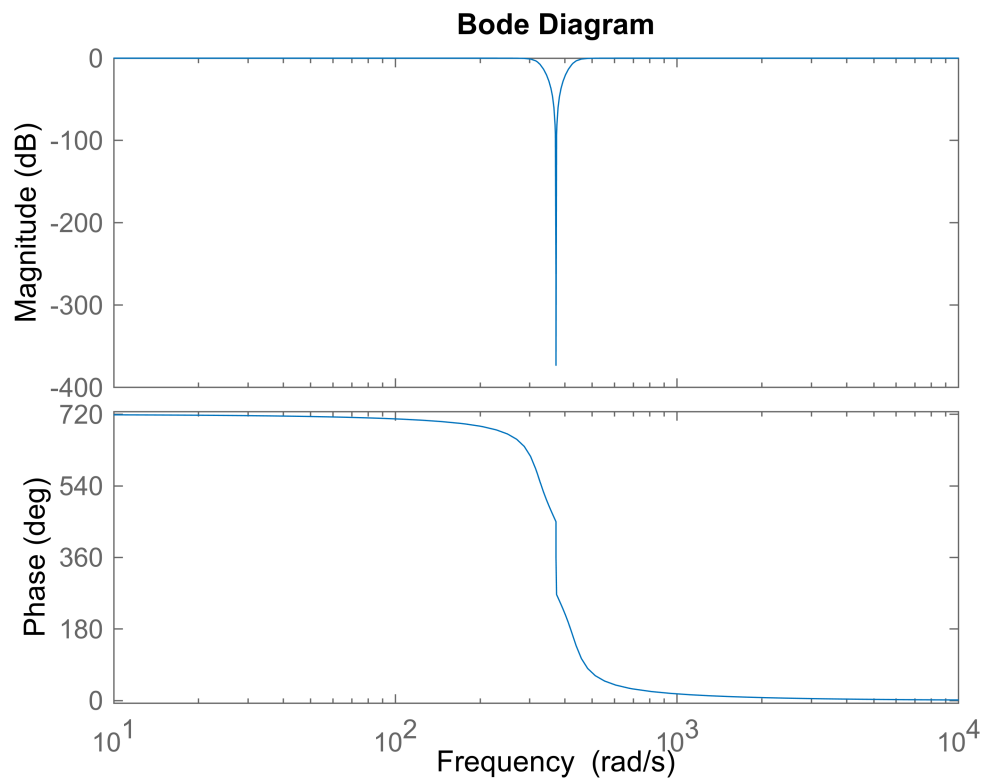


```
RLCFilteredSignal = lsim(Hf,x,t);
myFFT(RLCFilteredSignal,fs)
```



Butter Filter

```
[num,den] = butter(3,[2*pi*50 2*pi*70], 'stop', 's');  
Hf = tf(num,den);  
bodeplot(Hf)
```



```
ButterFilteredSignal = lsim(Hf,x,t);  
myFFT(ButterFilteredSignal,fs)
```

