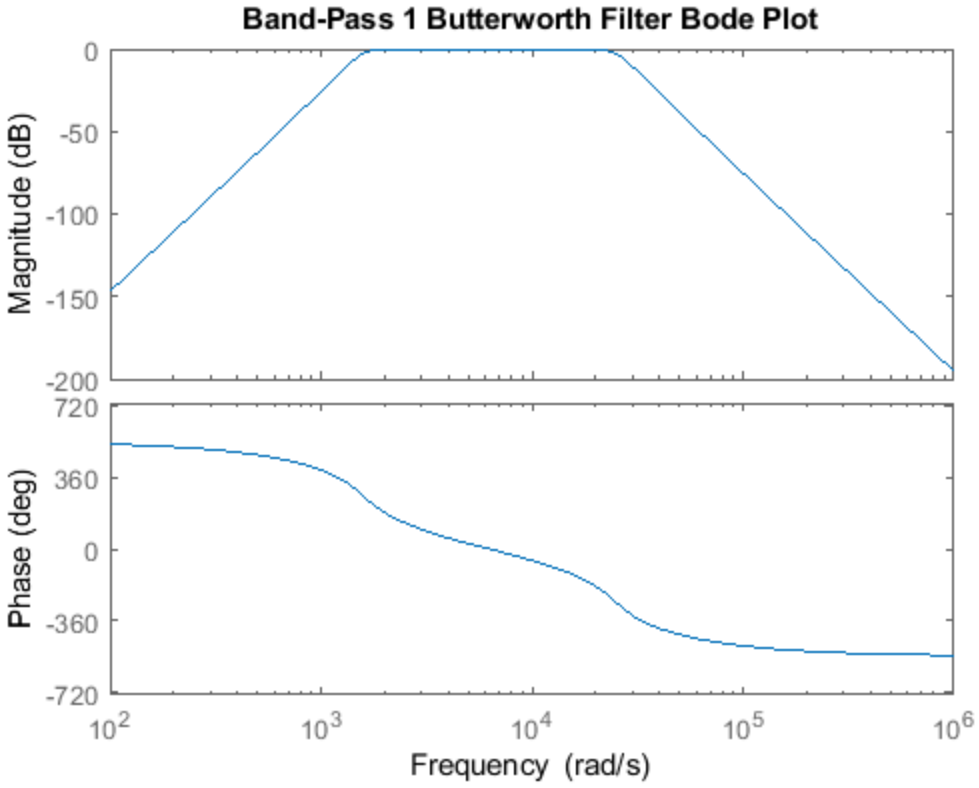
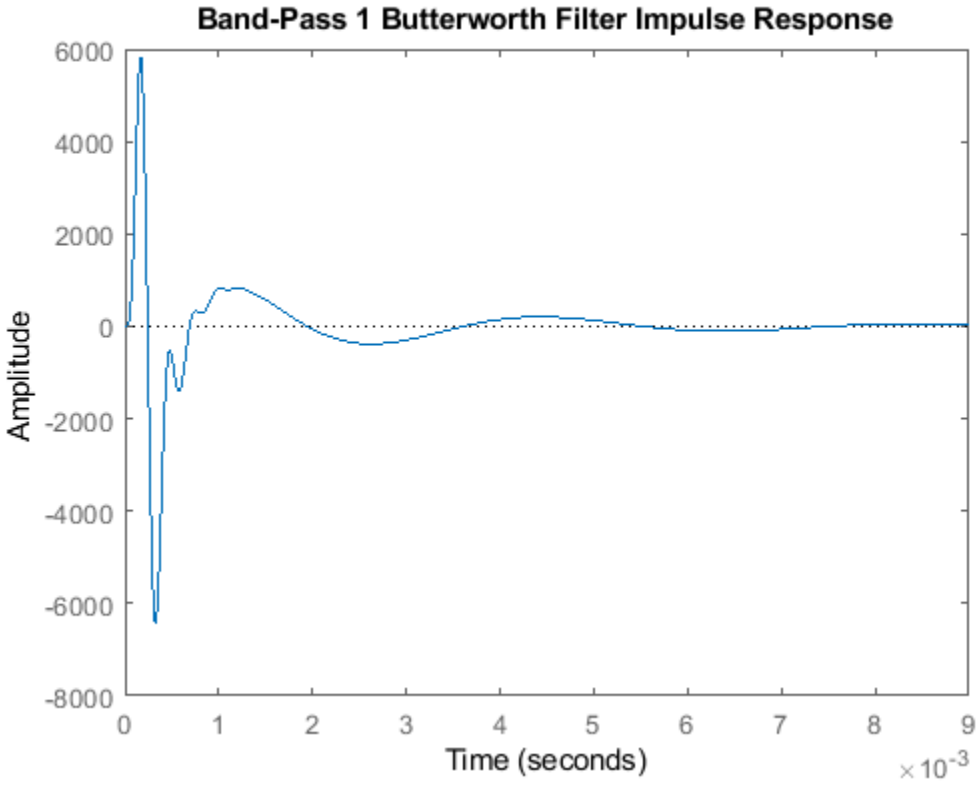
```
%Transfer Function Analysis for Band-Pass 1 6th Order Butterworth
 Filter
%ECE223 Sp19, Jennifer Jordan & David Lay

s = tf('s');
x = (.267*((s/6283.19)+(6283.19/s))); %LP to HP transformation
 condition
H = 1/((x^2+.5176*x+1)*(x^2+1.4142*x+1)*(x^2+1.9319*x+1))
%Figures:
figure(1);
bode(H);
title('Band-Pass 1 Butterworth Filter Bode Plot');
figure(2);
impulse(H);
title('Band-Pass 1 Butterworth Filter Impulse Response');
figure(3);
step(H);
title('Band-Pass 1 Butterworth Filter Step Response');
figure(4);
pzplot(H);
title('Band-Pass 1 Butterworth Filter Pole-Zero Plot');
```

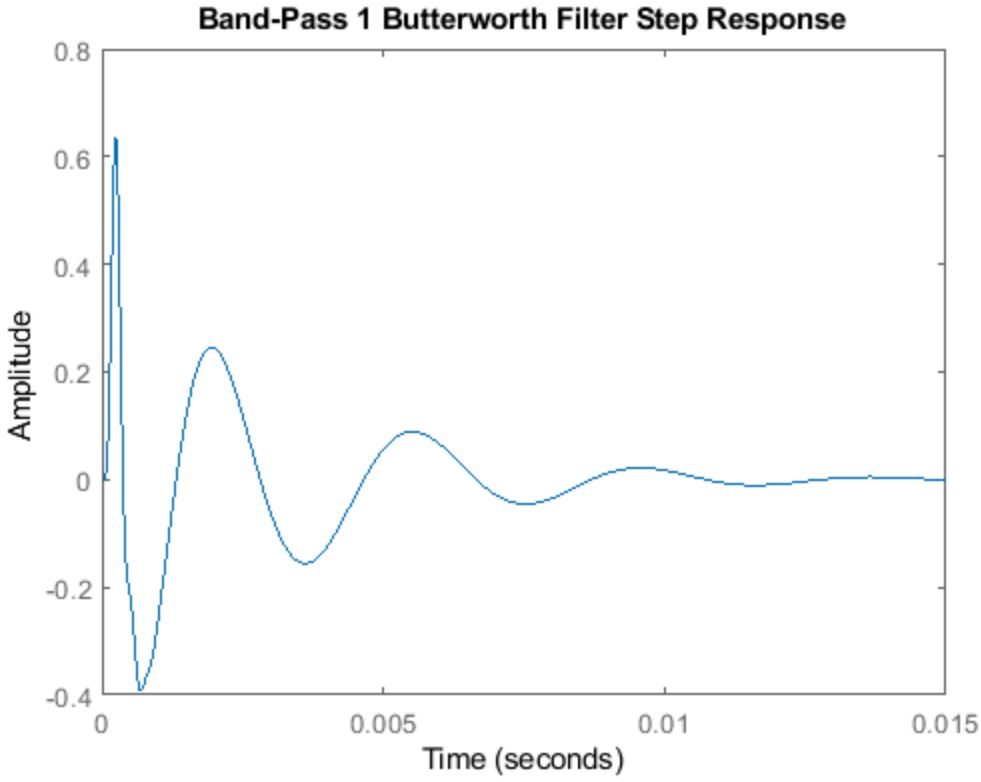
H =

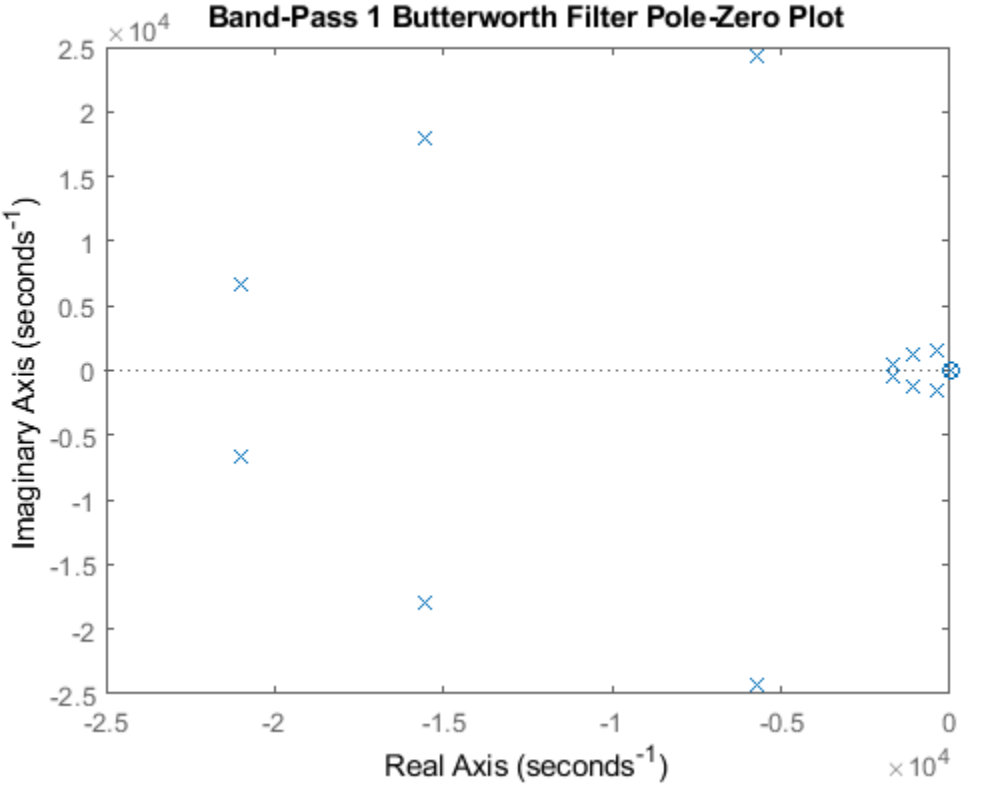
$$\frac{1.526e34\ s^9}{8.987e07\ s^{15} + 8.171e12\ s^{14} + 3.928e17\ s^{13} + 1.232e22\ s^{12} + 2.665e26\ s^{11} + 3.901e30\ s^{10} + 3.509e34\ s^9 + 1.54e38\ s^8 + 4.153e41\ s^7 + 7.58e44\ s^6 + 9.54e47\ s^5 + 7.836e50\ s^4 + 3.402e53\ s^3}$$

Continuous-time transfer function.


Band-Pass 1 Butterworth Filter Bode Plot
Magnitude (dB)
0
-50
-100
-150
-200
Phase (deg)
720
360
0
-360
-720
10^2
10^3
10^4
10^5
10^6
Frequency (rad/s)


Band-Pass 1 Butterworth Filter Impulse Response
Amplitude
6000
4000
2000
0
-2000
-4000
-6000
-8000
0
1
2
3
4
5
6
7
8
9
Time (seconds)
$\times 10^{-3}$


Band-Pass 1 Butterworth Filter Step Response
Amplitude
Time (seconds)
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0
0.005
0.01
0.015


Band-Pass 1 Butterworth Filter Pole-Zero Plot
Imaginary Axis (seconds-1)
Real Axis (seconds-1)
×10^4
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-2.5
-2
-1.5
-1
-0.5
0
×10^4

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