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% Author: Spencer Goulette
% ECE 486 - HW #3 Problem 5
% February 12th, 2019
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clear variables
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Problem 5

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f = linspace(-0.5,0.5,1001); % Frequency from -0.5 to 0.5
z = exp(1i .* 2 .* pi .* f); % Z
H1 = (1.0000.*z.^(2) + 1.6180.*z.^(1) + 1.0000)./(1.*z.^(2) +
-1.5371.*z.^(1) + 0.9025); % Filter 1 H(z)
H2 = (1.0000.*z.^(2) - 0.6180.*z.^(1) + 1.0000)./(1.*z.^(2) -
0.8100); % Filter 2 H(z)

H = (20*log10(abs(H1 .* H2))); % Gain in dB without G
G = 1 / 10^(max(H) / 20) % G to make max gain 1 V/V <--- Answer to
Part A
H = H1 .* H2; % Gain in V/V without G
HG = H1 .* H2 .* G; % Gain in V/V with G

Fig1 = figure('Position', [200, 75, 850, 600]); % set figure size and
location <--- Answer to Part B
plot(f,H,f,HG); % stem plot
grid on; % add grid
set(gca, 'fontsize', 16); % increase font size
xlabel('frequency, Hz', 'fontsize', 16); % x label
ylabel('Gain, V/V', 'fontsize', 16); % y label
title('Homework 3, problem 5', 'fontsize', 16); % title
legend('Gain without G', 'Gain with G'); % legend

x = [3 1.5 -1.8 0.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]; % x[n] for the
0<=n<=19
xG = x .* G; % After G stage

a1 = [1.0000 -1.5371 0.9025]; % Coefficients for Filter 1
b1 = [1.0000 1.6180 1.0000];
a2 = [1.0000 0.0000 -0.8100]; % Coefficients for Filter 2
b2 = [1.0000 -0.6180 1.0000];

y1 = filter(a1,b1,xG); % Filter 1
y2 = filter(a2,b2,y1); % Filter 2

x = x'; % Transpose rows to columns and rename
G = xG';
Filter1 = y1';
Filter2 = y2';

T = table(x,G,Filter1,Filter2) % Create table <--- Answer to Part C

G =
```

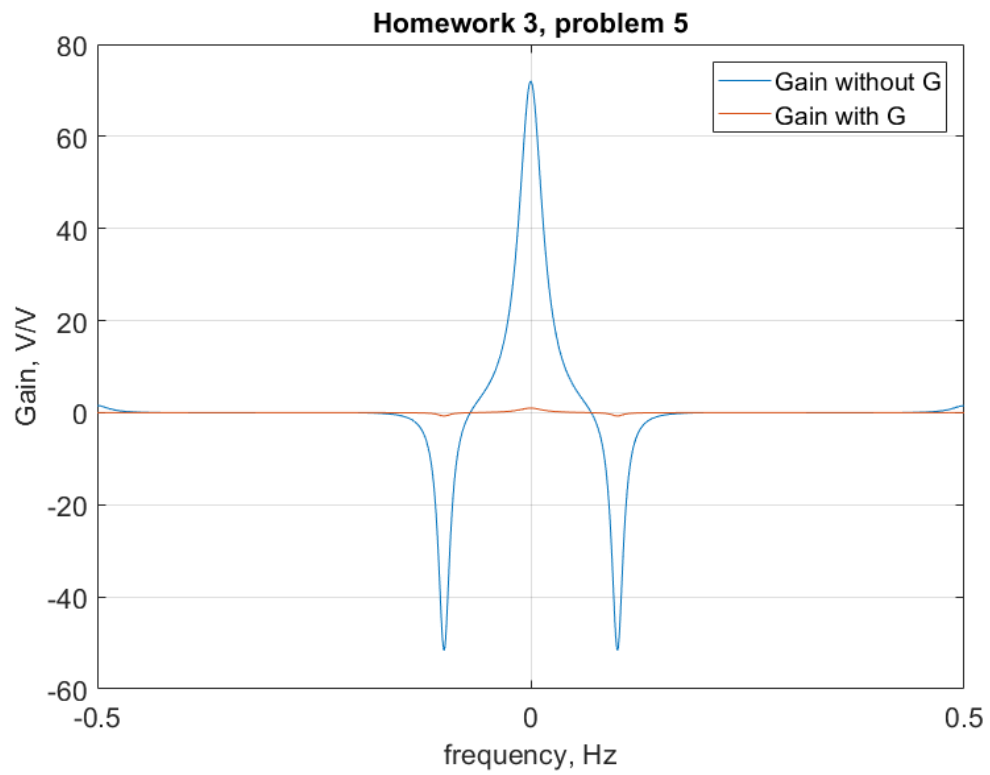
0.0139

Warning: Imaginary parts of complex X and/or Y arguments ignored

T =

20×4 table

x	G	Filter1	Filter2
3	0.041655	0.041655	0.041655
1.5	0.020827	-0.1106	-0.084855
-1.8	-0.024993	0.11788	-0.0099566
0.2	0.002777	-0.02014	0.14815
0	0	-0.11212	-0.10609
0	0	0.20405	0.0066568
0	0	-0.21804	-0.017022
0	0	0.14874	-0.033723
0	0	-0.022615	0.15018
0	0	-0.11214	-0.10609
0	0	0.20407	0.0066428
0	0	-0.21803	-0.017002
0	0	0.14871	-0.033732
0	0	-0.022582	0.15018
0	0	-0.11217	-0.10609
0	0	0.20408	0.0066288
0	0	-0.21803	-0.016983
0	0	0.14869	-0.03374
0	0	-0.02255	0.15018
0	0	-0.1122	-0.10608



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