

## Code

L4.12:

```
function [A_s, A_c, r, v_0] = invCCPP(b0, b1, a1, a2)
    r = sqrt(a2);
    cos_v0 = -a1 / (2*r);
    sin_v0 = sqrt(1 - cos_v0^2);
    A_c = b0;
    A_s = (b1 + r * A_c * cos_v0) / (r * sin_v0);
    v_0 = acos(cos_v0) / pi;
end
```

L4.13:

```
% Put in the coefficients
b0 = 2;
b1 = 3;
a1 = -1;
a2 = 0.81;
% Run through my function
[A_s, A_c, r, v_0] = invCCPP(b0, b1, a1, a2);
n=0;
xn_1 = A_c * r^n * cos(pi * v_0 * n) + A_s * r^n * sin(pi * v_0 * n);
%equation from P4.12
%show answers
disp(['A_s = ', num2str(A_s), ', A_c = ', num2str(A_c), ', r = ', num2str(r),
', v_0 = ', num2str(v_0)]);
disp("Part 1");
disp(xn_1);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% Part 2 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
samples = 20;
xn = zeros(1, samples);
for n = 0:(samples)
    xn(n + 1) = A_c * r^n * cos(pi * v_0 * n) + A_s * r^n * sin(pi * v_0 * n);
%equation from P4.12
end
disp("Part 2");
disp(xn);
```

**Output:**

**P4\_13**

**A\_s = 5.3452, A\_c = 2, r = 0.9, v\_0 = 0.31251**

**Part 1**

**2**

**Part 2**

**Columns 1 through 13**

**2.0000 5.0000 3.3800 -0.6700 -3.4078 -2.8651 -0.1048 2.2159 2.3008 0.5059  
-1.3578 -1.7675 -0.6678**

**Columns 14 through 21**

**0.7640 1.3048 0.6860 -0.3709 -0.9266 -0.6262 0.1244 0.6316**

**P4.14:**

```
% Coefficients
b0 = [-2, 5.65, -2.88];
a0 = [1, -0.1, 0.09, 0.648];
% residuez to find partial fraction expansion
[ro, po, ko] = residuez(b0, a0);
%[bo, ao] = residuez(ri, pi, ki);
% Display the results
disp("ro: ");
disp(ro);
disp("po: ");
disp(po);
disp("ko: ");
disp(ko);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% Part 2 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
b0 = 1.0000 - 0.8660i;
b1 = -4.0000 + 0.0000i;
a1 = 0.4500 + 0.7794i;
a2 = -0.8000 + 0.0000i;
% call my function
[A_s, A_c, r, v_0] = invCCPP(b0, b1, a1, a2);
% show result
disp(['A_s = ', num2str(A_s)]);
disp(['A_c = ', num2str(A_c)]);
disp(['r = ', num2str(r)]);
disp(['v_0 = ', num2str(v_0)]);
```

**Output:**

**P4\_14**

**ro:**

**1.0000 - 0.8660i**

**1.0000 + 0.8660i**

**-4.0000 + 0.0000i**

**po:**

**0.4500 + 0.7794i**

**0.4500 - 0.7794i**

**-0.8000 + 0.0000i**

**ko:**

**A\_s = 0.43137+5.3629i**

**A\_c = 1-0.866i**

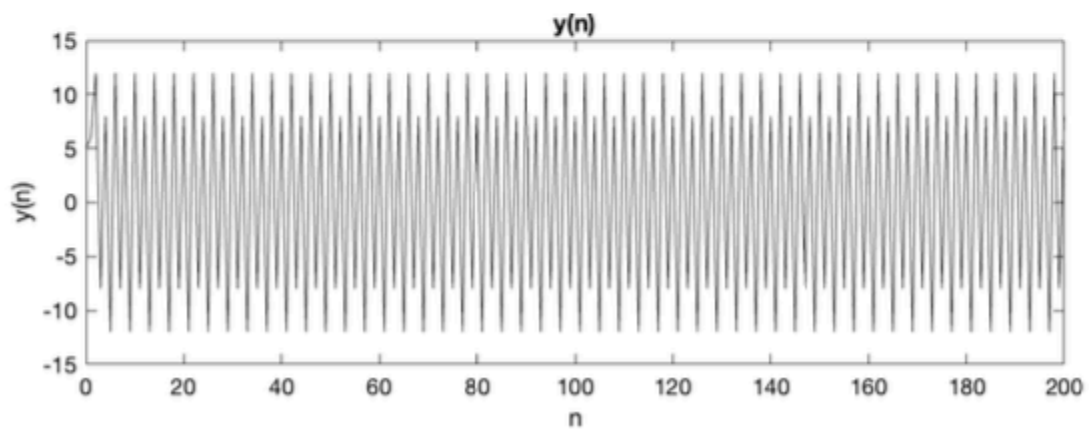
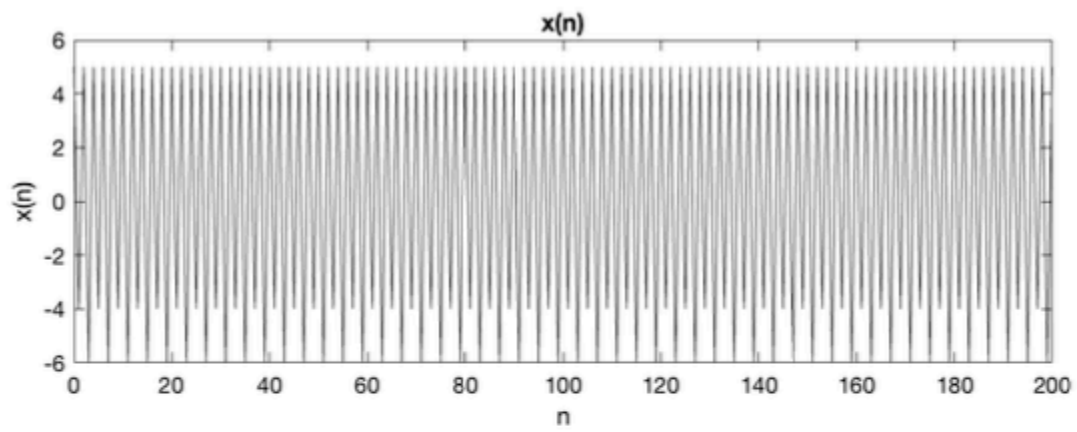
**r = 0+0.89443i**

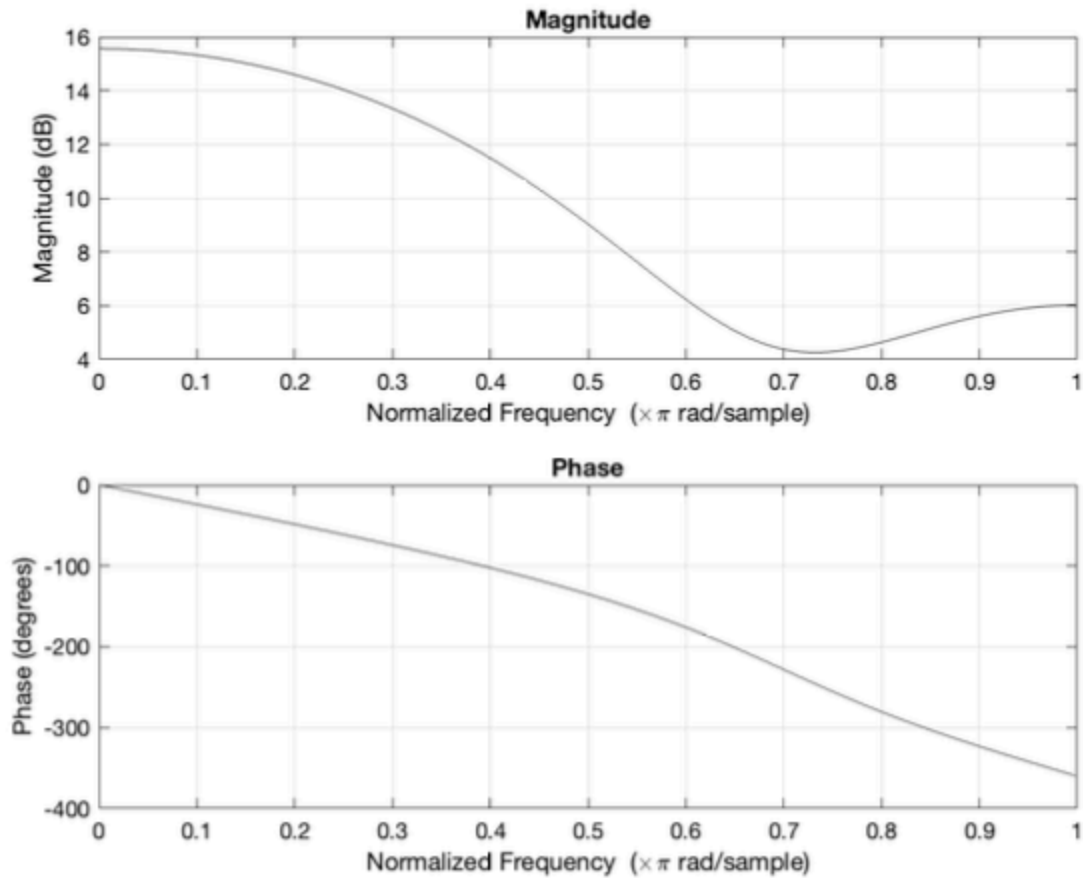
**v\_0 = 0.63792-0.087134i**

**P4.21:**

```
b = [1, 2, 3];  
a = 1;  
figure;  
freqz(b, a);  
n = 0:200; % 200 samples  
x_n = sin(pi*n/2) + 5*cos(pi*n);  
y_n = filter(b, a, x_n);  
%plot  
figure;  
subplot(2, 1, 1);  
plot(n, x_n);  
xlabel('n');  
ylabel('x(n)');  
subplot(2, 1, 2);  
plot(n, y_n);  
xlabel('n');  
ylabel('y(n)');
```

## Plots





**P4.22:**

```

b = [1, 0, 0, 0, 1];
a = [1, 0, 0, 0, -0.8145];
figure;
freqz(b, a);
n = 0:200; % 200 samples
x_n = sin(pi*n/2) + 5*cos(pi*n);
y_n = filter(b, a, x_n);
%plot
figure;
subplot(2, 1, 1);
plot(n, x_n);
xlabel('n');
ylabel('x(n)');
subplot(2, 1, 2);
plot(n, y_n);
xlabel('n');
ylabel('y(n)');

```

Plot:

