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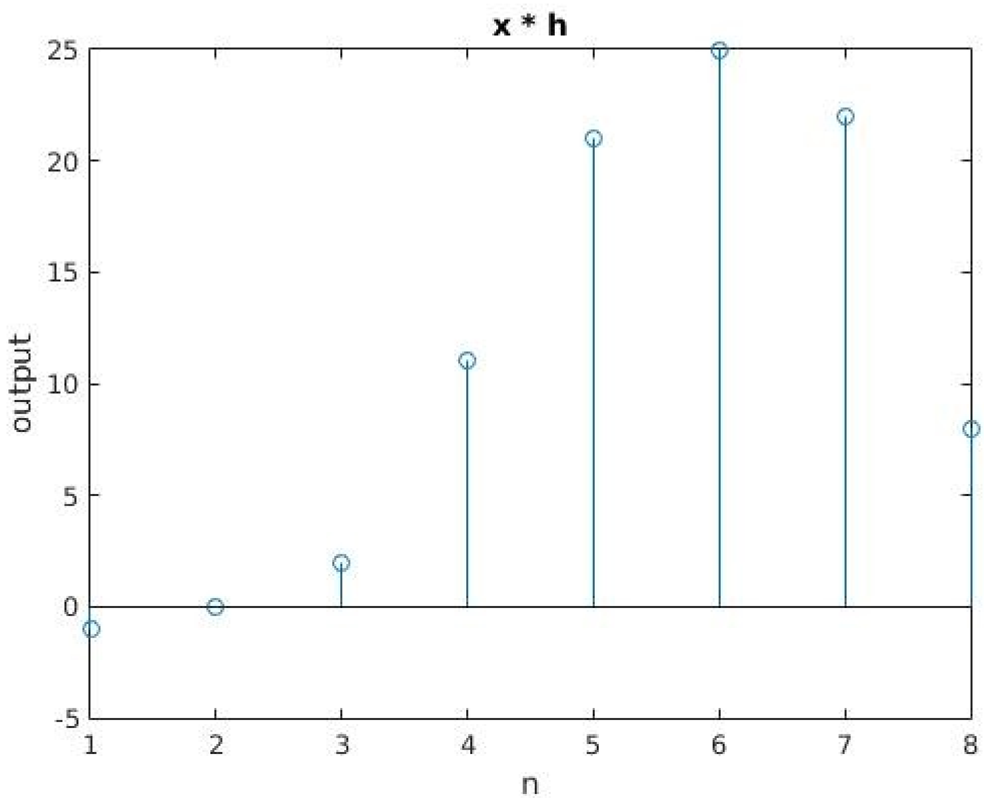
Report Item 1:
Code:

```
function [y] = myDFTConv(x,h)
total = length(x)+length(h)-1;
X = fft(x,total);
H = fft(h,total);
Y = X .* H;
y = ifft(Y)
end
```

command script:

```
x = [-1,2,1,5,4]
h = [1,2,3,2]
y = myDFTConv(x,h)
y_ = conv(x,h)

stem(y)
title('x * h')
xlabel('n')
ylabel('output')
```

figure:



The order of complexity is 3NlogN

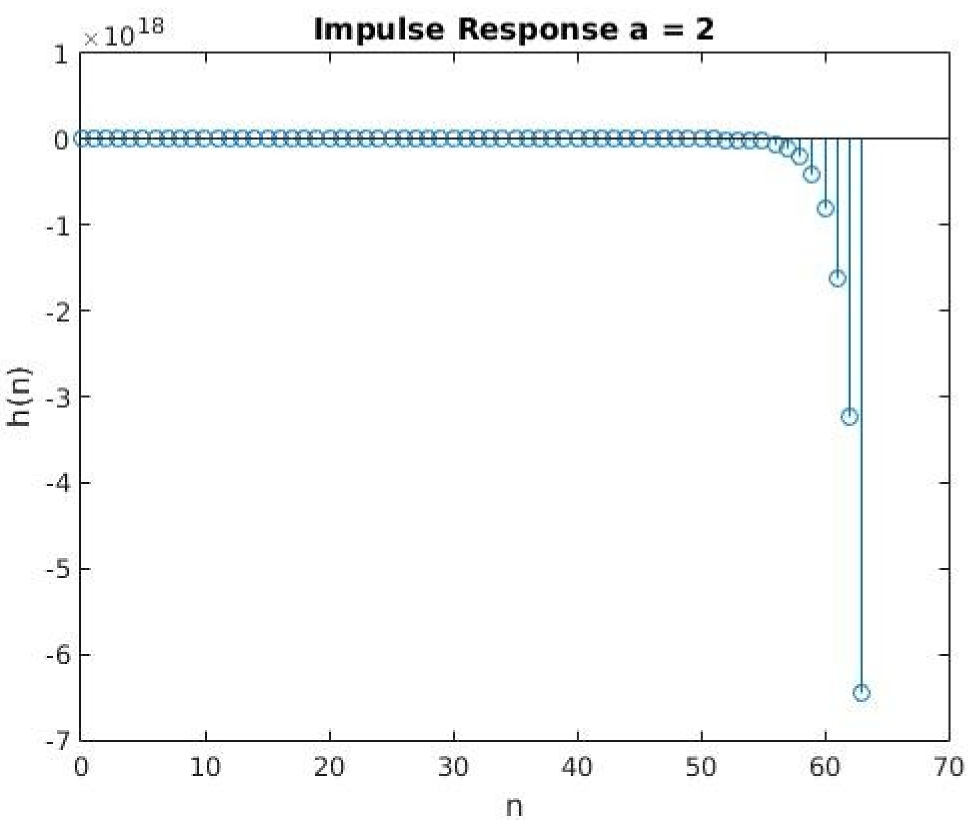
Report Item 2:
code:

```
function [y] = sys1(a,x)
B = [0.3,-2]
A = [1,-a]
y = filter(B,A,x)
end
```

command script:

```
n = [0:63]
delta = [n == 0]
output = sys1(2,delta)
stem(n,output);
title('Impulse Response a = 2')
xlabel('n')
ylabel('h(n)')
```

figure:



This system is not stable for the impulse response is not absolutely summable. The system is causal since it does not involve x(n+k) term where k > 0

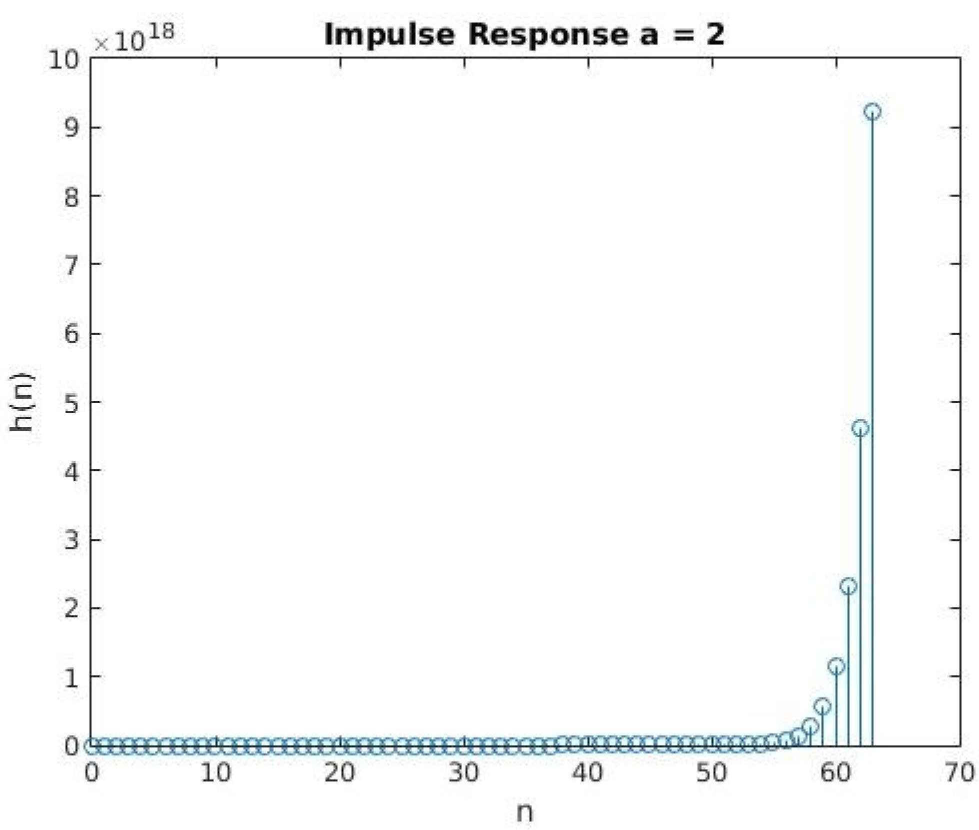
Report Item 3:
code:

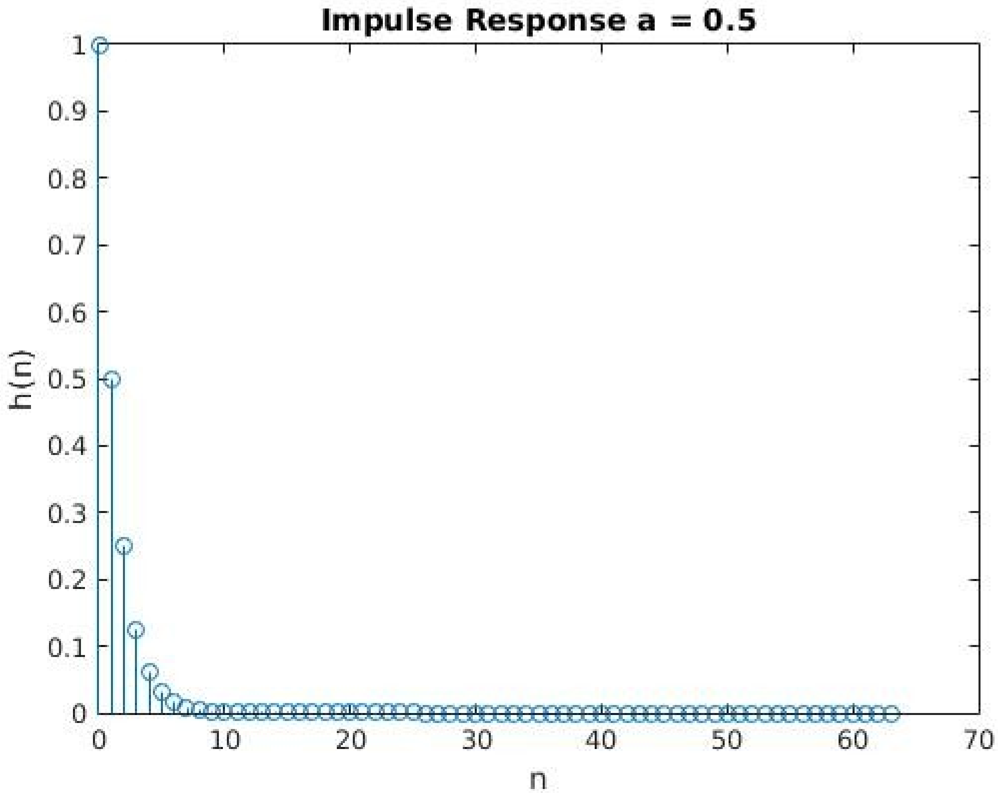
```
function [y] = sys2(a,x)
   for i = 1:length(x)
      if i == 1
         y(i) = x(i) * x(i);
      else
         y(i) = a * y(i-1) + x(i) * x(i);
      end
   end
end
```

command script:

```
n = [0:63]
delta = [n == 0]
output = sys2(2,delta)
stem(n,output);
title('Impulse Response a = 2')
xlabel('n')
ylabel('h(n)')

figure(2)
output_ = sys2(0.5,delta);
stem(n,output_);
title('Impulse Response a = 0.5')
xlabel('n')
ylabel('h(n)')
```

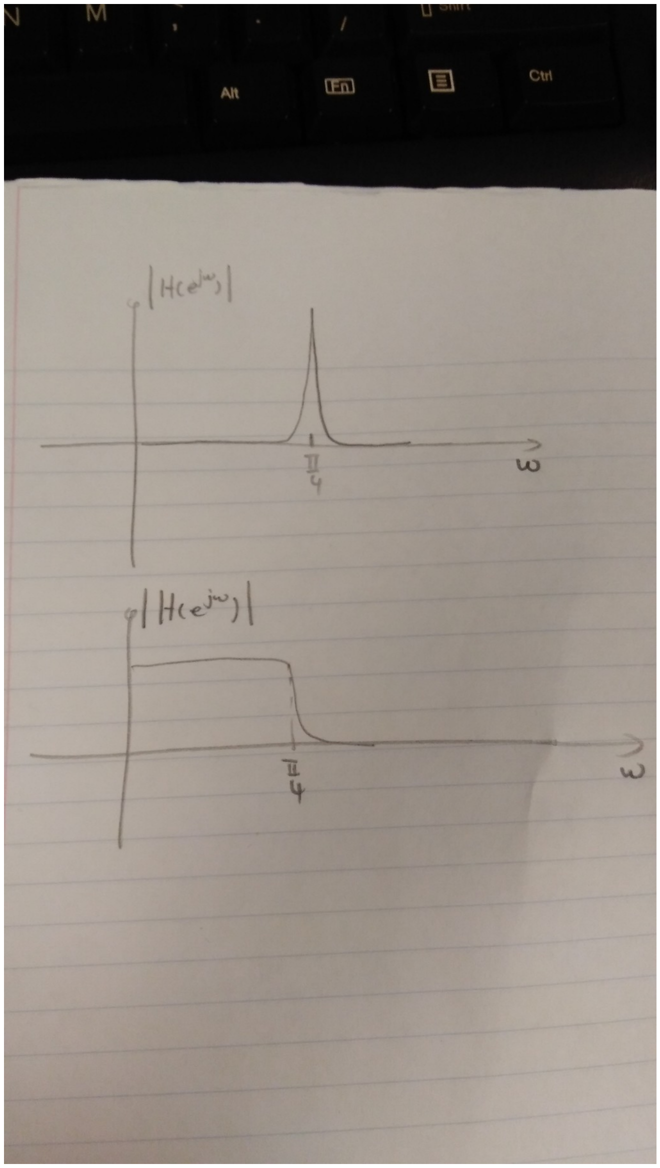
figure:





System is causal since it does not need to know future input regardless of the value of a. It's not stable when a = 2 for a delta function input results in an unbounded output. It's stable when a = ½ since the output is bounded. In neither case is the system linear since output involves a (x(n))^2 term. Therefore we cannot find the output to either system via convolution.

Report Item 4:



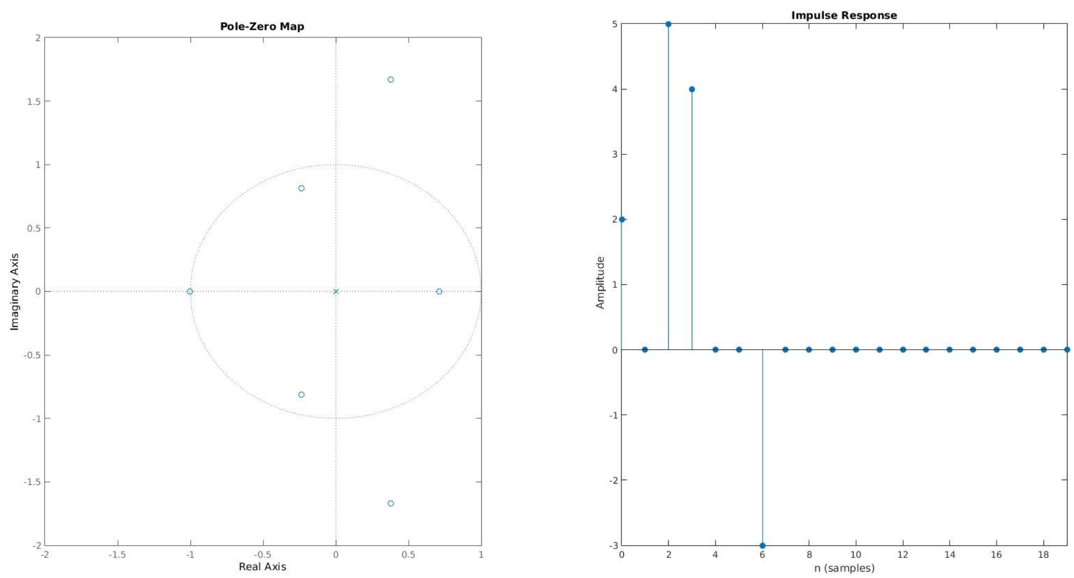
Report Item 5
code:

```
%H1
b1 = [2,0,5,4,0,0,-3]
a1 = [1]
H1 = tf(b1,a1,-1,'Variable','z^-1')
N = 20
figure(1)
subplot(121)
pzplot(H1)
subplot(122)
impz(b1,a1,N)

%H2
```

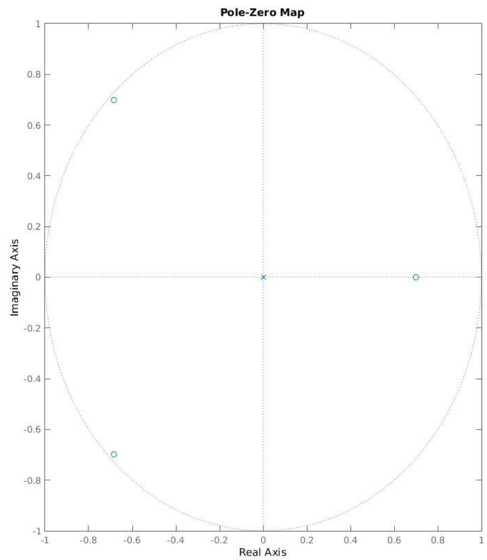
```
b2 = [3,2,0,-2]
a2 = [1]
H2 = tf(b2,a2,-1,'Variable','z^-1')
N = 20
figure(2)
subplot(121)
pzplot(H2)
subplot(122)
impz(b2,a2,N)


%H3\
b3 = [0,0,0,1,0,0,1,-2]
a3 = [12,1,0,4]
H3 = tf(b3,a3,-1,'Variable','z^-1')
N = 20
figure(3)
subplot(121)
pzplot(H3)
subplot(122)
impz(b3,a3,N)
```

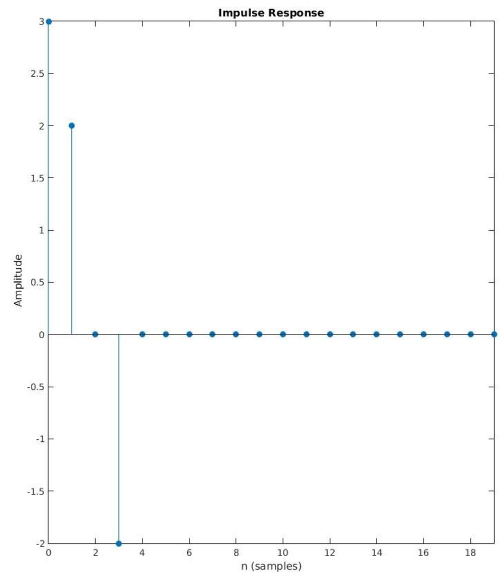
figure:

H1:

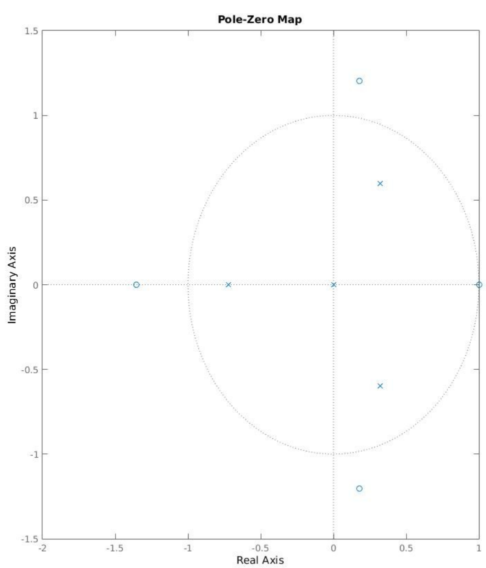


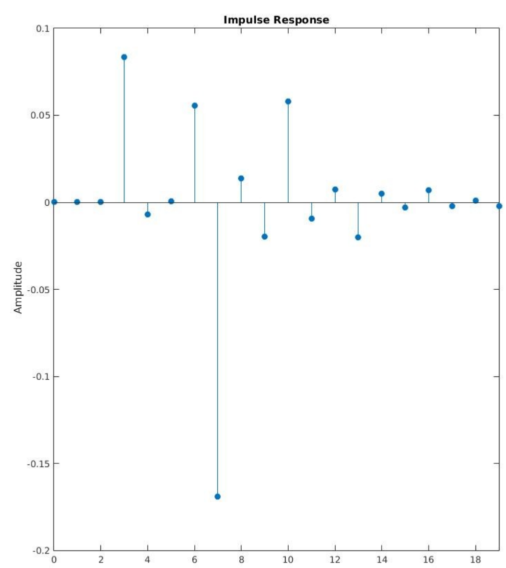
H2:


Pole-Zero Map
Imaginary Axis
Real Axis


Impulse Response
Amplitude
n (samples)

H3:

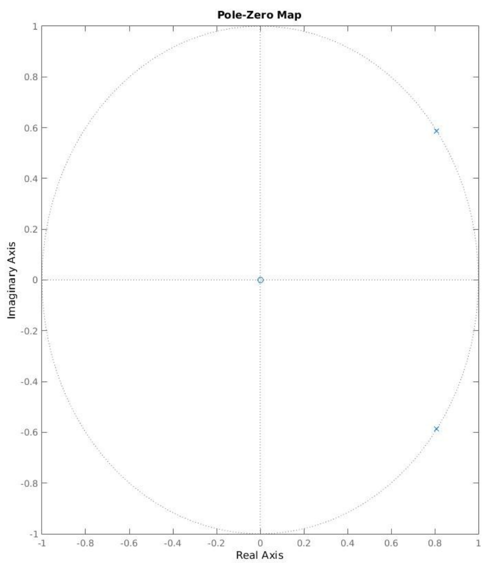

Pole-Zero Map
Imaginary Axis
Real Axis

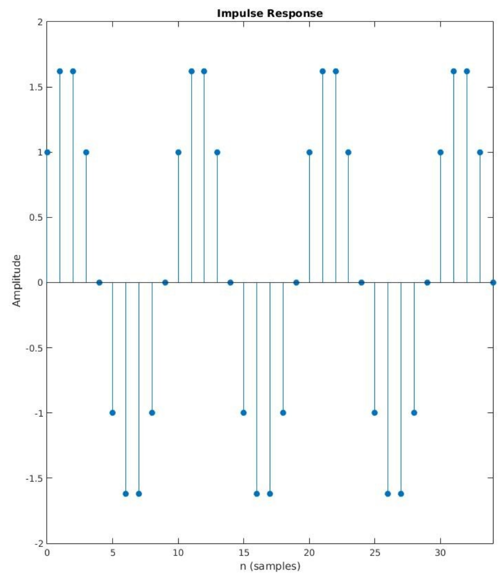

Impulse Response
Amplitude
n (samples)

Stability:
H1: stable
H2: stable
H3: stable

All poles in each figure are inside the unit circle

Report Item 6:





The system is not BIBO stable since the there are poles on the unit circle. The system would be stable as long as the input does not have sinusoidal component with frequency of 8π/10.