Chandler Bottomley
862005947
EE 111 lab 5

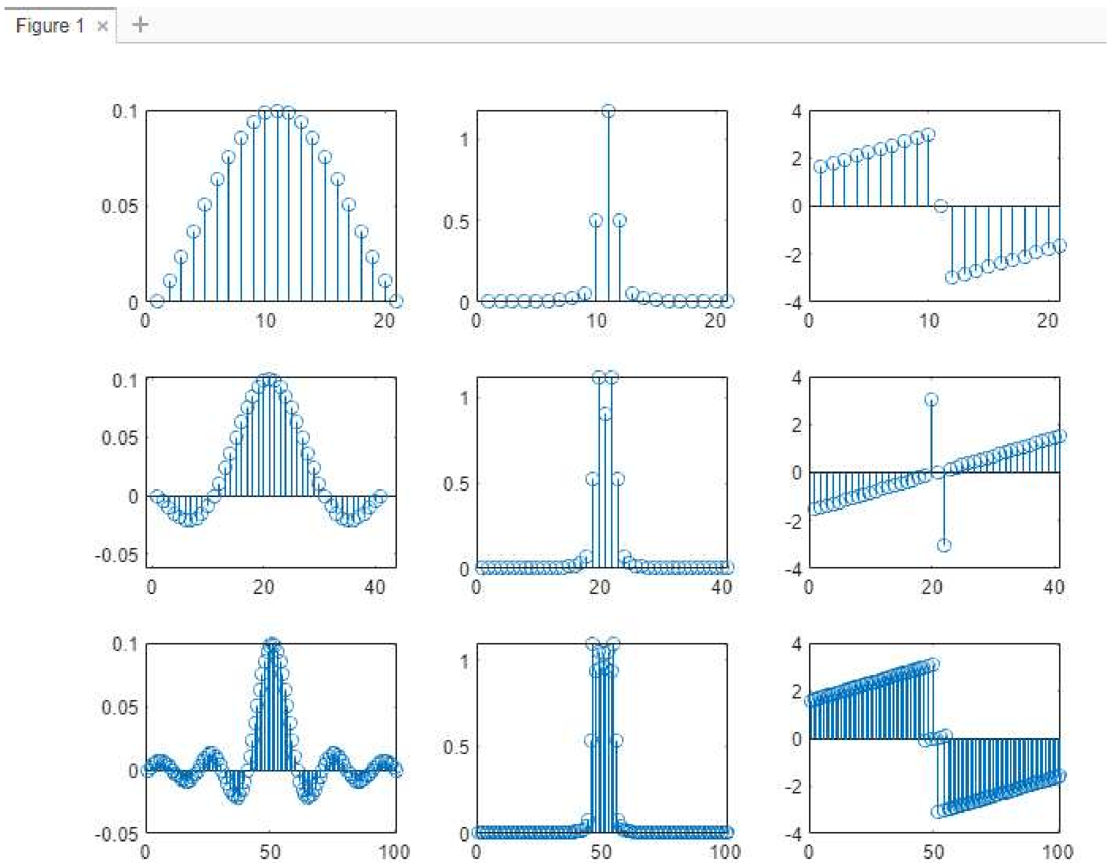
Abstract:
For this lab our goal is to test the effects of shifting the time domain has on the magnitude and phase of the ideal filter. We also end up testing the effects of the filter when we use a triangle pulse signal as the truncation.

Task 1:

```
%shifiting 10
n0  =10;
n = 0 : 2*n0;
h = sin((pi.*(n-n0))./10)./(pi.*(n-n0));
h(n0+1) = 1/10;
H = fft(h);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,1);
stem(h);
subplot(3,3,2);
stem(mag);
subplot(3,3,3);
stem(phase);
```

```
%shifiting 20
n0  =20;
n = 0 : 2*n0;
h = sin((pi.*(n-n0))./10)./(pi.*(n-n0));
h(n0+1) = 1/10;
H = fft(h);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,4);
stem(h);
subplot(3,3,5);
stem(mag);
subplot(3,3,6);
stem(phase);
```

```
%shifiting 50
n0  =50;
n = 0 : 2*n0;
h = sin((pi.*(n-n0))./10)./(pi.*(n-n0));
h(n0+1) = 1/10;
H = fft(h);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,7);
stem(h);
subplot(3,3,8);
stem(mag);
subplot(3,3,9);
stem(phase);
```



For this task we put a rectangular pulse through the filter and shifted it 3 times. We shifted the signal by 10, 20, 50. From shifting and truncating we can see that when we shift by 20 we see an inverse in phase. From the magnitude we see there is not much change in the actual value of the magnitude but we see there are more values around that max value when we shift more.

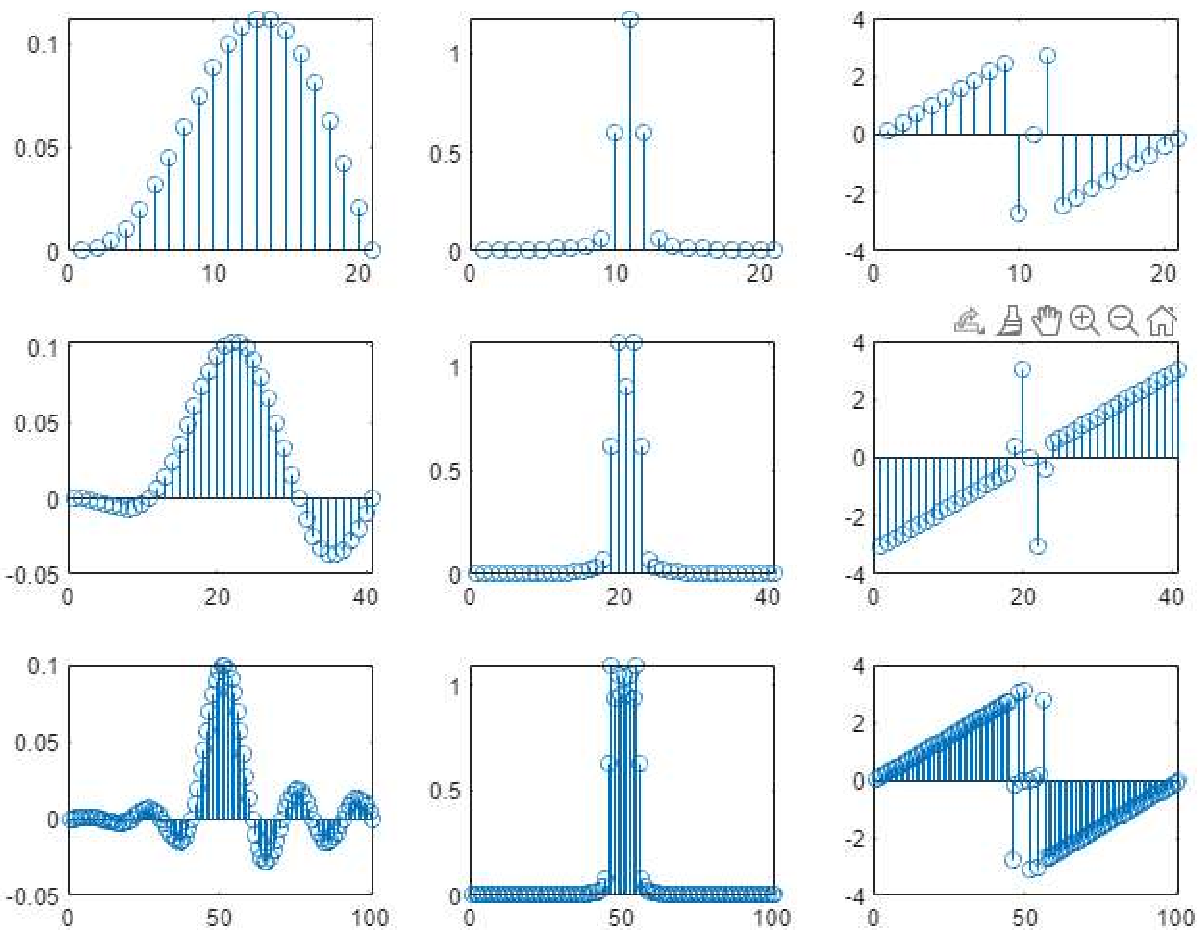
The only major change we see in the angle is that the values inverse when we shift by 20 otherwise it is the same as the magnitude where there are more values.

Task 2:

```
%shifiting 10
n0 = 10;
n1 = 0 : n0-1;
n2 = n0 + 1: 2*n0;
h2 = sin((pi.*(n1-n0))./10)./(pi.*(n1-n0)) .* (1+(n1-n0)/n0);
h2 = [h2, 1/10];
h3 = sin((pi.*(n2-n0))./10)./(pi.*(n2-n0)) .* (1+(n2-n0)/n0);
h2=[h2,h3];
H = fft(h2);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,1);
stem(h2);
subplot(3,3,2);
stem(mag);
subplot(3,3,3);
stem(phase);
```

```
%shifiting 20
n0 = 20;
n1 = 0 : n0-1;
n2 = n0 + 1: 2*n0;
h2 = sin((pi.*(n1-n0))./10)./(pi.*(n1-n0)) .* (1+(n1-n0)/n0);
h2 = [h2, 1/10];
h3 = sin((pi.*(n2-n0))./10)./(pi.*(n2-n0)) .* (1+(n2-n0)/n0);
h2=[h2,h3];
H = fft(h2);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,4);
stem(h2);
subplot(3,3,5);
stem(mag);
subplot(3,3,6);
stem(phase);
```

```
%shifiting 50
n0 = 50;
n1 = 0 : n0-1;
n2 = n0 + 1: 2*n0;
h2 = sin((pi.*(n1-n0))./10)./(pi.*(n1-n0)) .* (1+(n1-n0)/n0);
h2 = [h2, 1/10];
h3 = sin((pi.*(n2-n0))./10)./(pi.*(n2-n0)) .* (1+(n2-n0)/n0);
h2=[h2,h3];
H = fft(h2);
H = fftshift(H);
mag = abs(H);
phase = angle(H);
figure(1);
subplot(3,3,7);
stem(h2);
subplot(3,3,8);
stem(mag);
subplot(3,3,9);
stem(phase);
```



For this task we followed the same procedure as part 1 except we used a triangle wave this time. From the triangle wave we see a similar trend as the rectangular wave and an interesting part is that we still get the flipped angle when we shift by 20 just like the rectangular wave. In terms of the magnitude we see an interesting change in the shift by 20 and 50 where the center value isn’t the max magnitude. Lastly we also see a change in the base wave where it seems like the more you shift it the less uniform the tail ends become.

Conclusion:
In the end it seems like the rectangular wave is more uniform and therefore seems like a better approximation of Ho.