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ECEN 444
Lab 2
9/12/2024

Code

L2.1:

```
%%%%%%%%%%%%%%%%%%%%    L2.1    %%%%%%%%%%%%%%%%%%%%
w = linspace(-2*pi, 2*pi); % range for omega
% the equation for frequency response
H = (1/(0 + 5 + 1)) .* exp(-1j .* w .* (5 - 0) / 2) .* (sin(w .* (0 + 5 + 1) /
2) ./ sin(w / 2));
% for magnitude and the phase
magH = abs(H);
phaseH = angle(H);
% plot
figure;
subplot(2,1,1);
plot(w, magH);
title('Magnitude');
xlabel('w');
ylabel('Function');
subplot(2,1,2);
plot(w, phaseH);
title('Phase');
xlabel('w');
ylabel('angle of funtion');
```

L2.2:

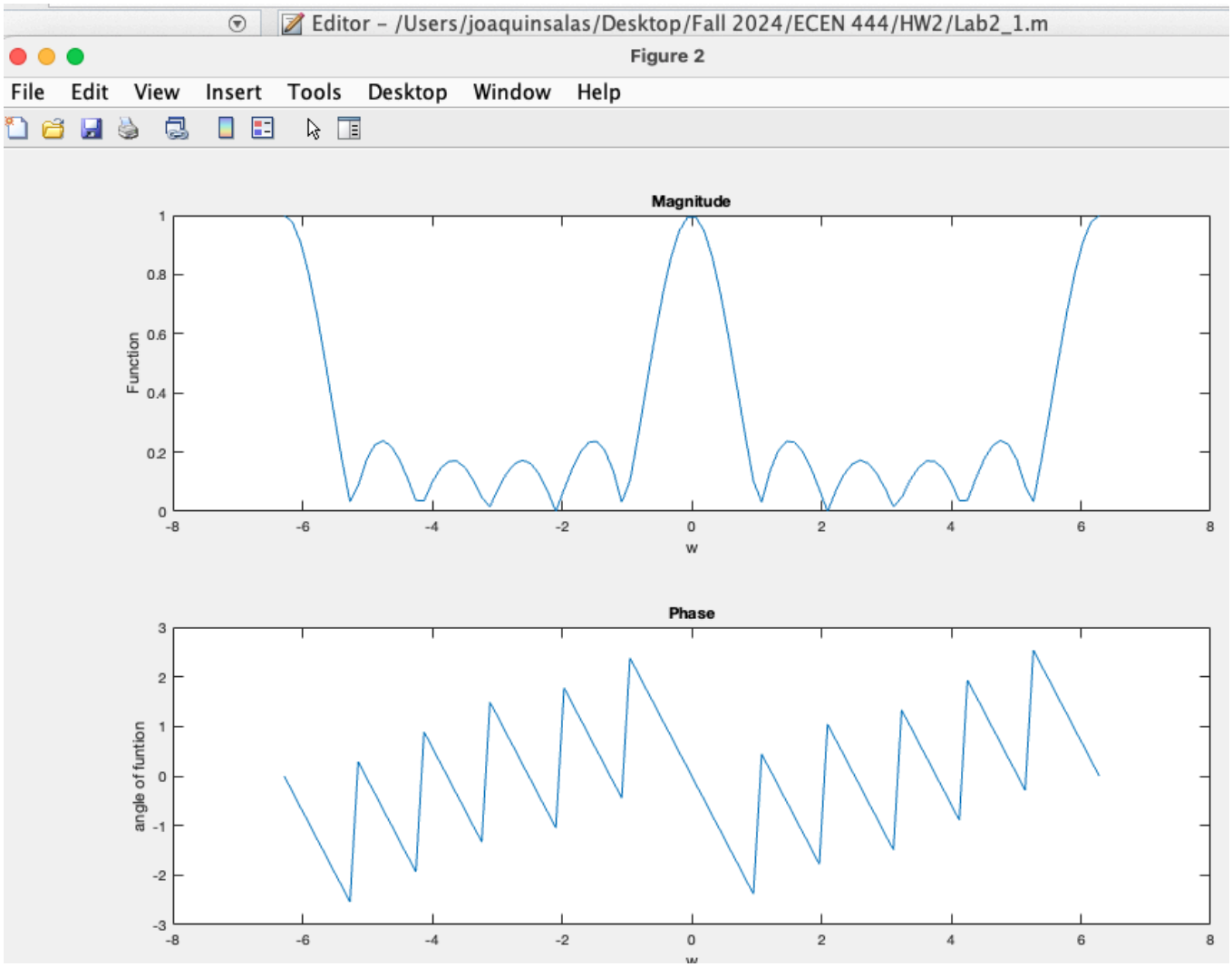
```
%%%%%%%%%%%%%%%%%%%%    L2.2 Part 1   %%%%%%%%%%%%%%%%%%%%
points = [1, 3, 7, 15, 50, 70]; % from textbook
w_c = pi / 25;
omega = linspace(-2, 2); %range
% make a plot for each value of N
figure;
for idx = 1:length(points)
   N = points(idx);
   % equation for gibbs phenomenon
   gibbs = zeros(1, length(omega));
   for n = -N:N
       if n == 0 % handle when n is 0, not plotting
           gibbs = gibbs + (w_c / pi) * exp(-1j * omega * n);
       else
           gibbs = gibbs + (sin(w_c * n) ./ (pi * n)) .* exp(-1j * omega * n);
       end
   end
```

```
    % subplots
    subplot(3, 2, idx);
    plot(omega, abs(gibbs));
    title(['N = ', num2str(N)]);
    xlabel('w');
    ylabel('Fourier Transform');
end

%%%%%%%%%%%%%%%%%%%%    L2.2 Part 2    %%%%%%%%%%%%%%%%%%%%
points = [1, 3, 7, 15, 50, 70]; % from textbook
w_c = pi / 15; % w_c1 = pi/25
omega = linspace(-2, 2); %range
% make a plot for each value of N
figure;
for idx = 1:length(points)
    N = points(idx);
    % equation for gibbs phenomenon
    gibbs = zeros(1, length(omega));
    for n = -N:N
        if n == 0 % handle when n is 0, not plotting
            gibbs = gibbs + (w_c / pi) * exp(-1j * omega * n);
        else
            gibbs = gibbs + (sin(w_c * n) ./ (pi * n)) .* exp(-1j * omega * n);
        end
    end
    % subplots
    subplot(3, 2, idx);
    plot(omega, abs(gibbs));
    title(['N = ', num2str(N)]);
    xlabel('w');
    ylabel('Fourier Transform');
end
```

Plots:

L1.1 -


Editor – /Users/joaquinsalas/Desktop/Fall 2024/ECEN 444/HW2/Lab2_1.m
Figure 2
File Edit View Insert Tools Desktop Window Help
Magnitude
Function
w
Phase
angle of funtion
w

L1.2 -

Reference:

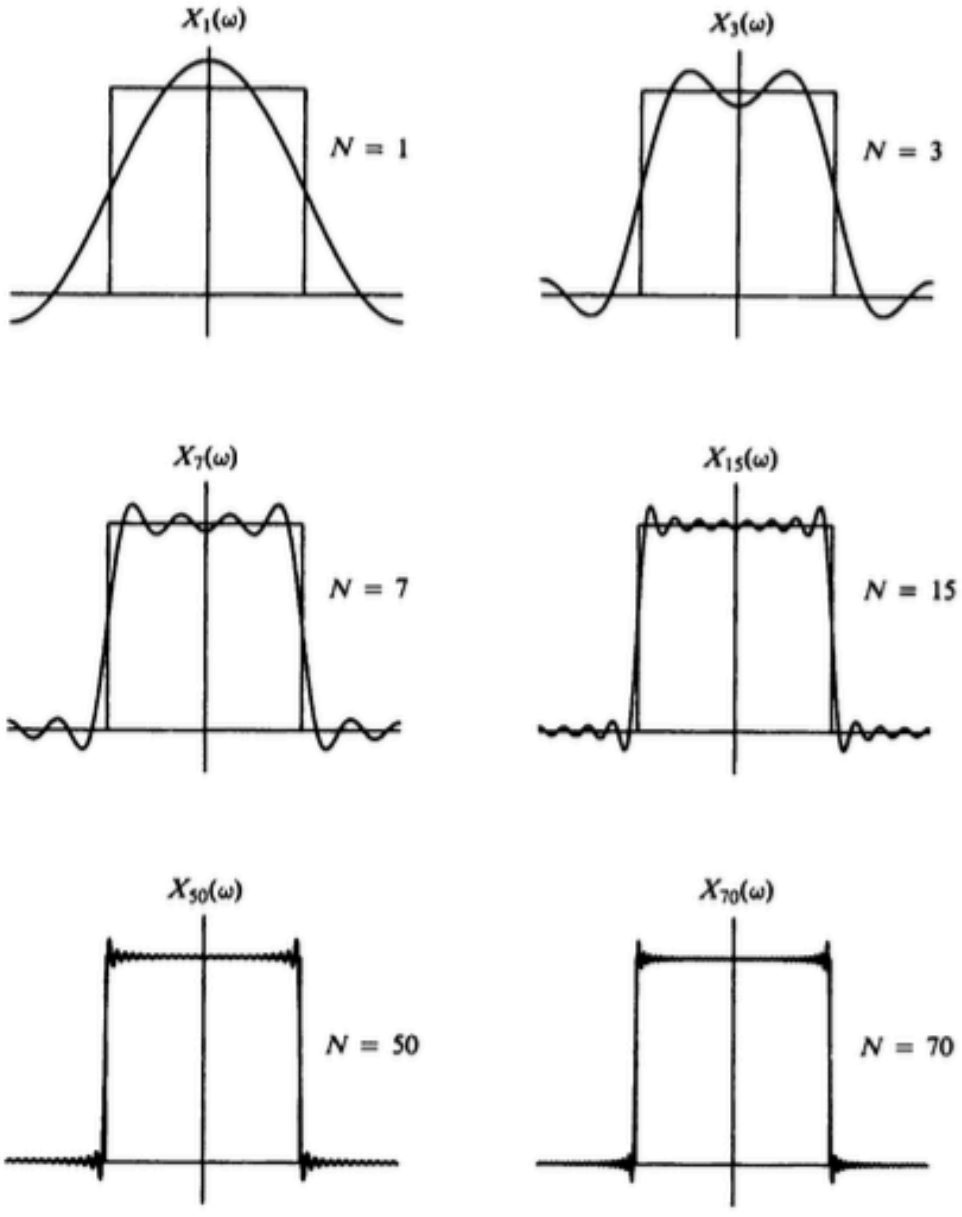


Figure 4.2.5 Illustration of convergence of the Fourier transform and the Gibbs phenomenon at the point of discontinuity.

First is for wc=pi/25 and second is wc=pi/15

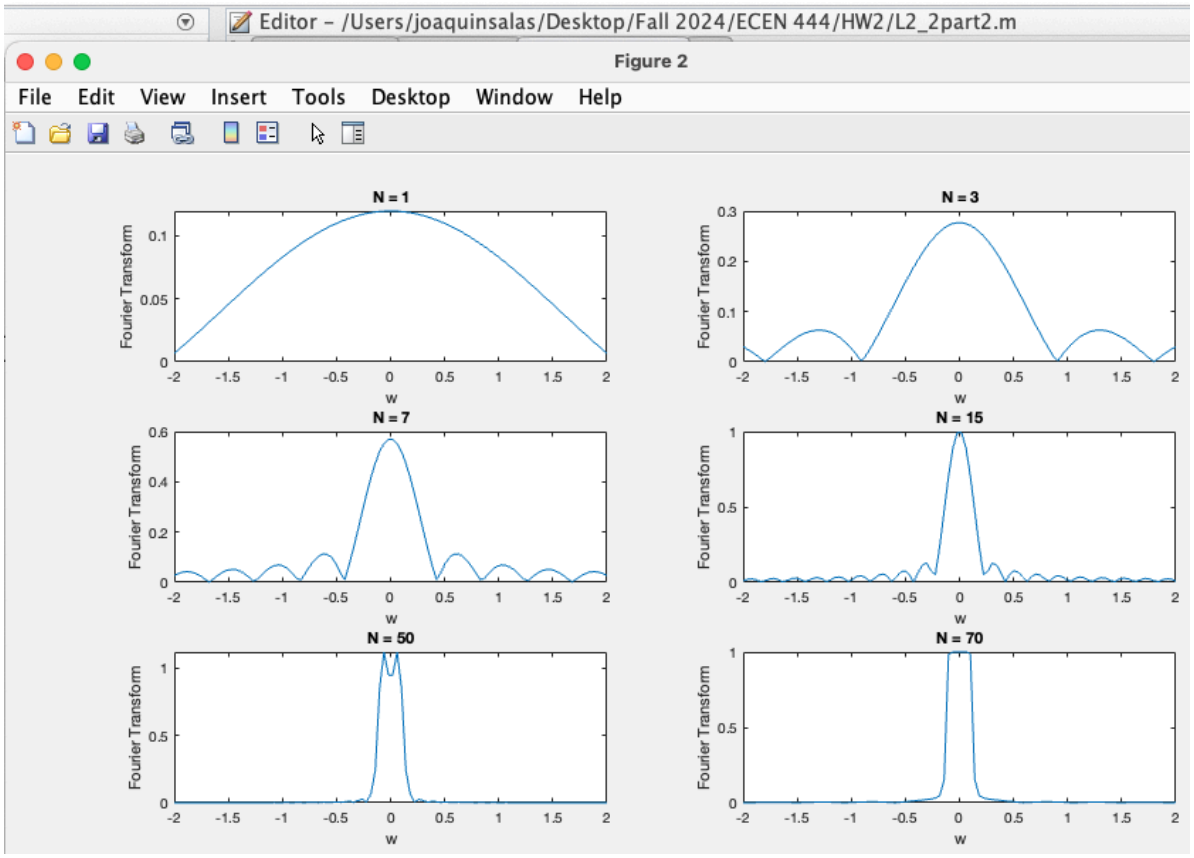

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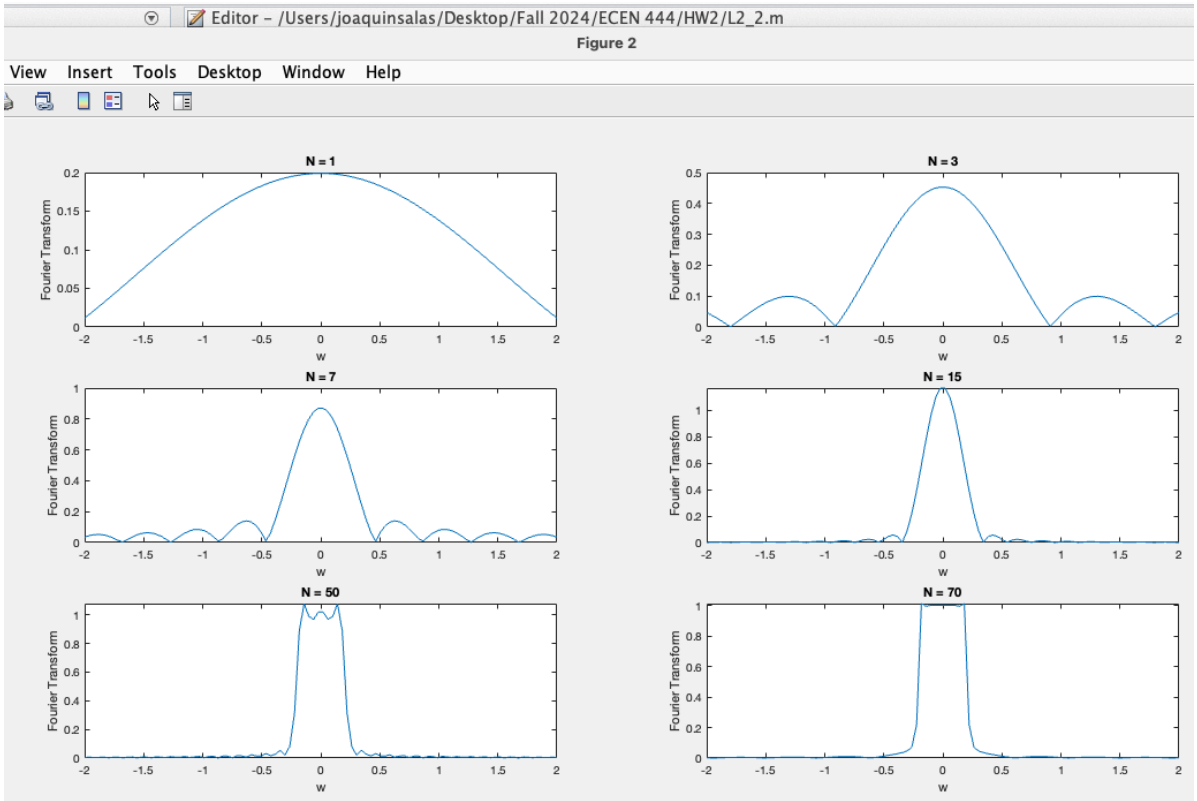
Figure 2
File Edit View Insert Tools Desktop Window Help
N = 1
N = 3
N = 7
N = 15
N = 50
N = 70
Fourier Transform
w


Editor – /Users/joaquinsalas/Desktop/Fall 2024/ECEN 444/HW2/L2_2.m
Figure 2
View Insert Tools Desktop Window Help
N = 1
N = 3
N = 7
N = 15
N = 50
N = 70
Fourier Transform
w