Signals and Systems Final Project Report

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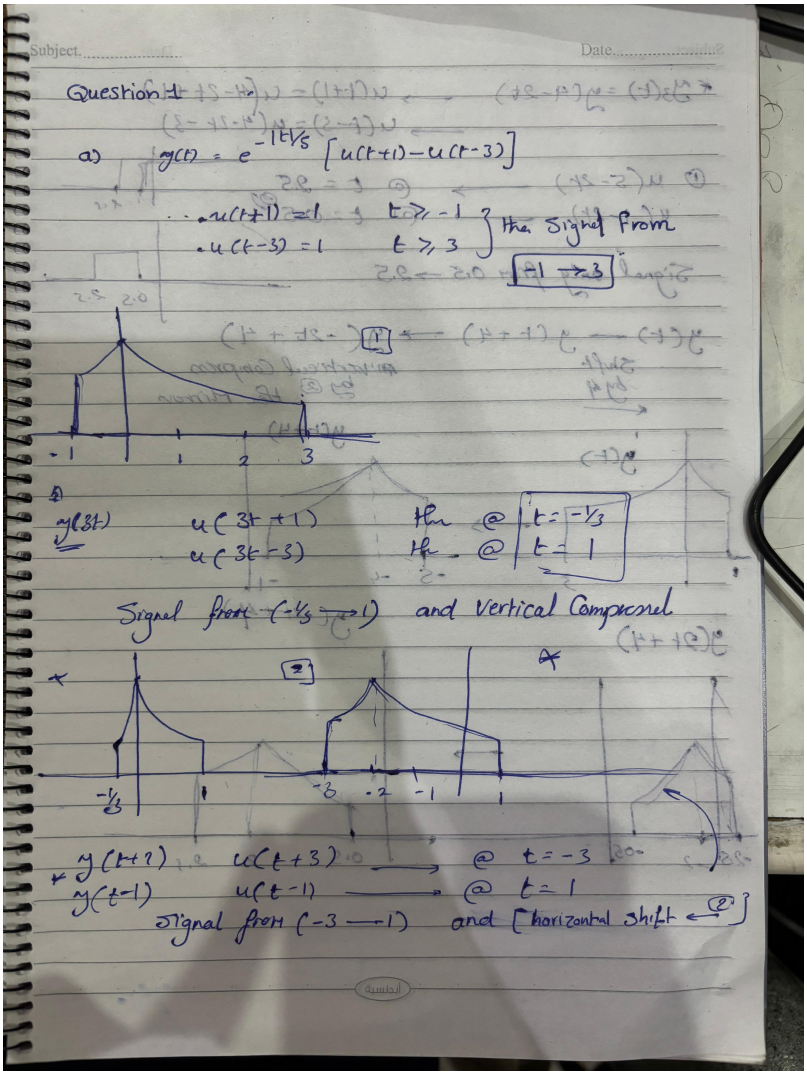
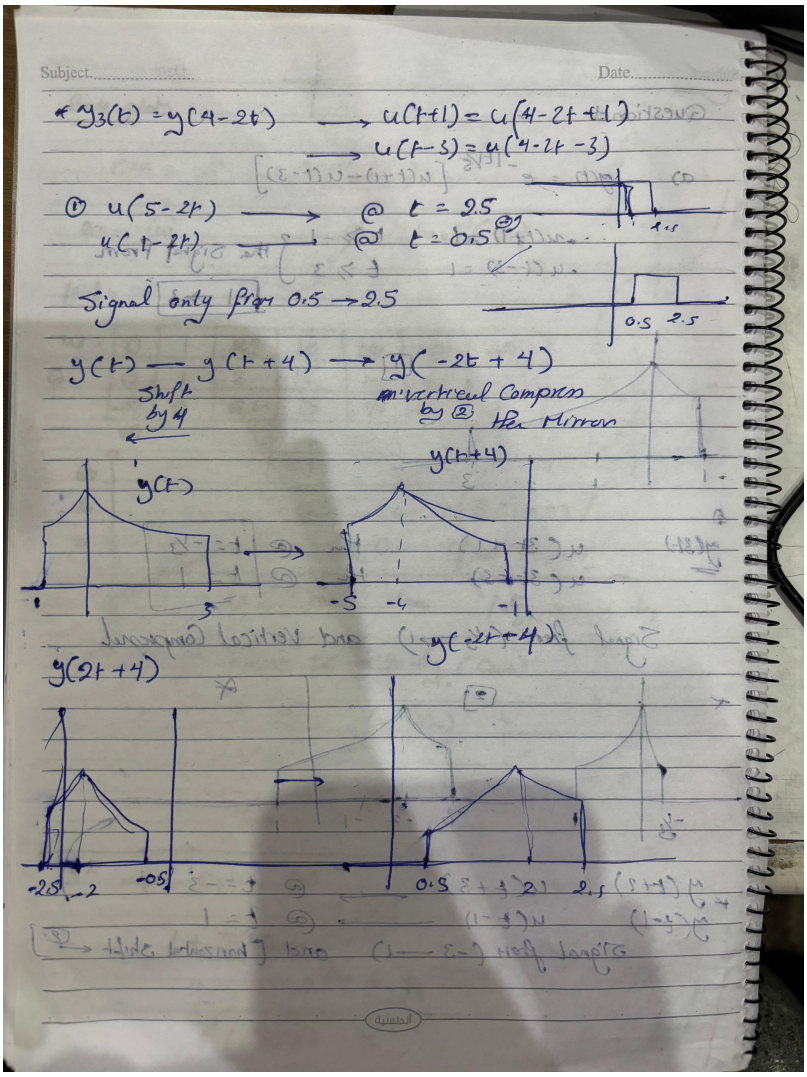
Part I (Handwritten and MATLAB)

Question1

a) Handwritten Solution

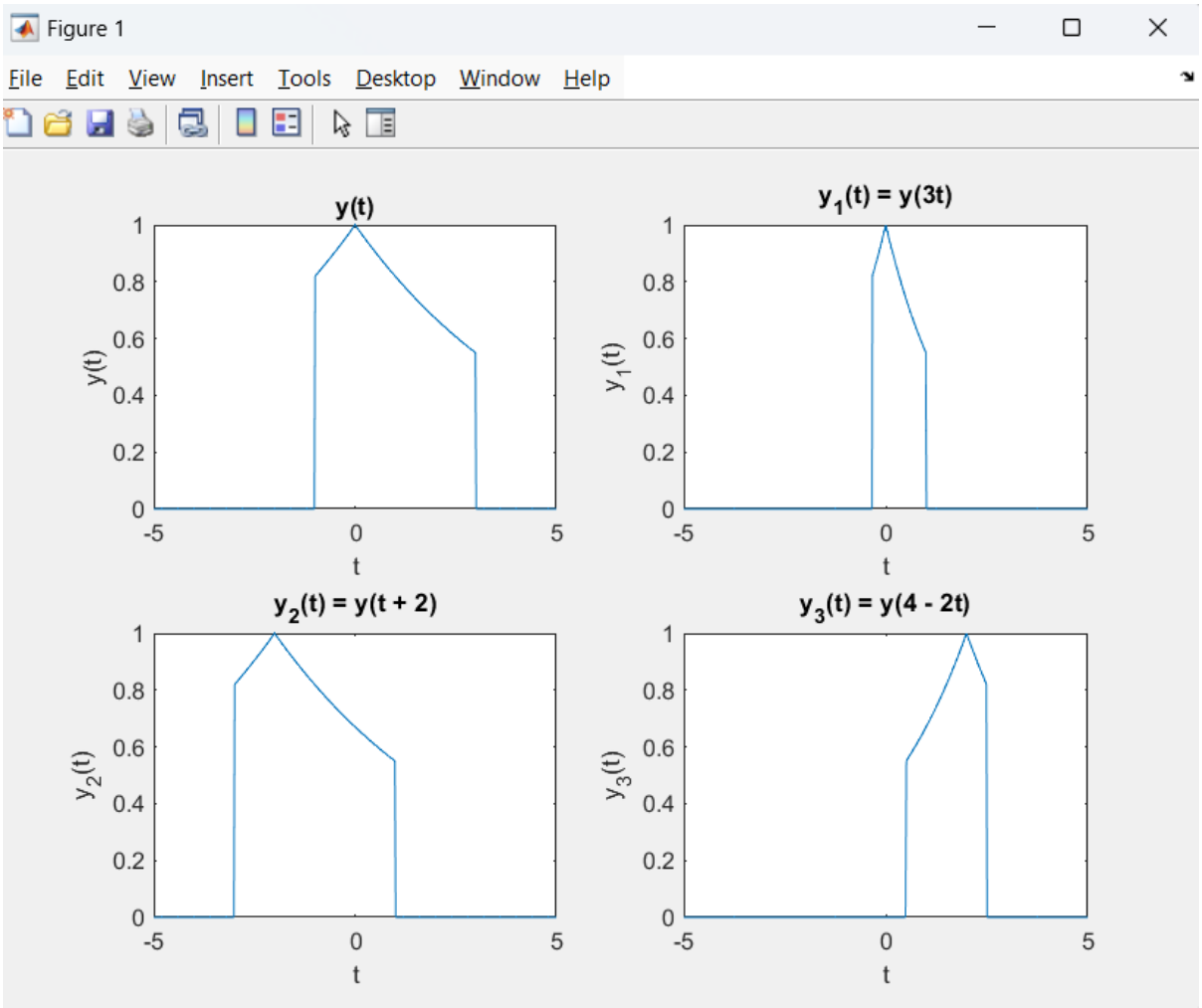




b) MATLAB Solution

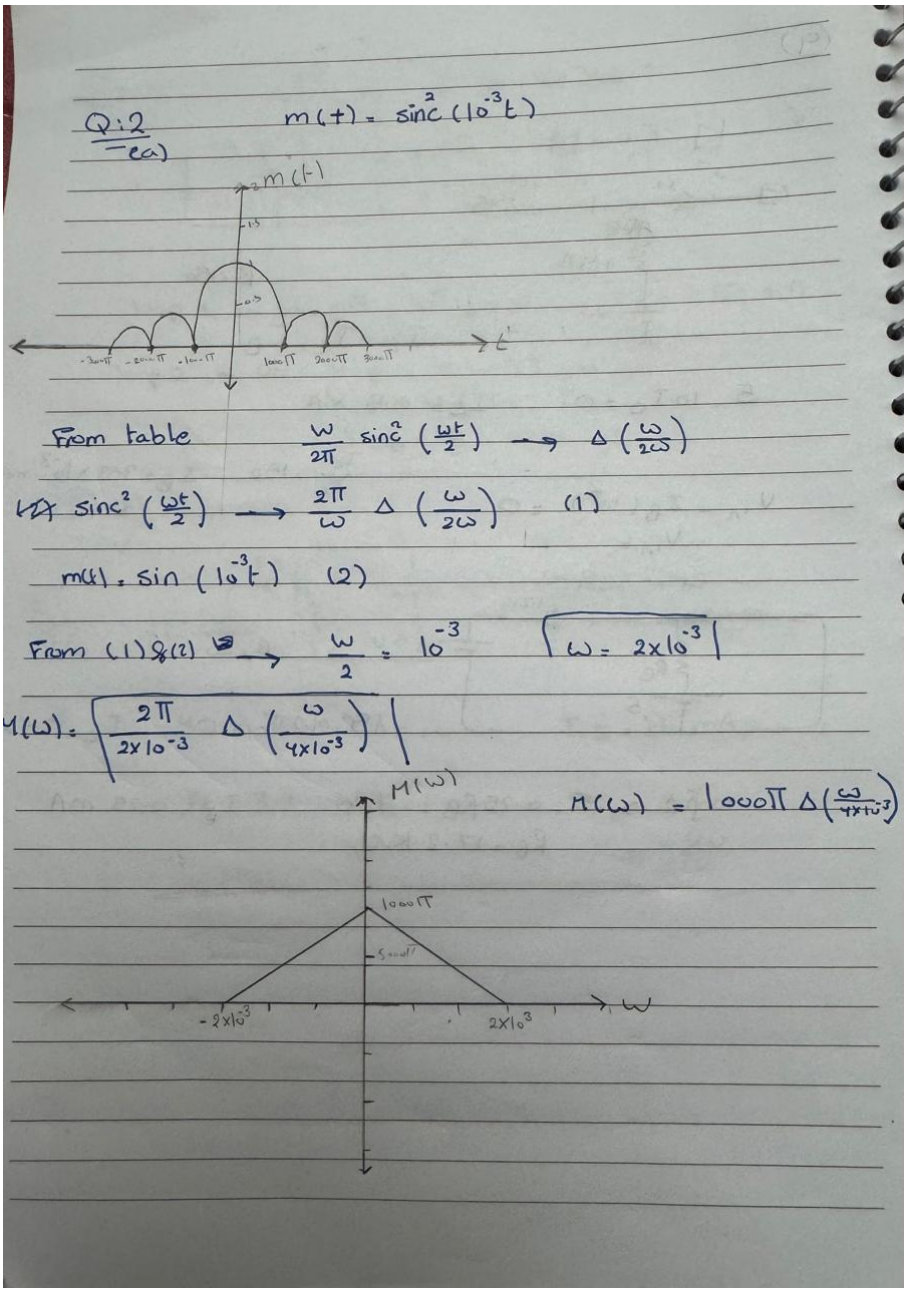
```
t = -5:0.01:5;

y = exp(-abs(t)/5) .* (heaviside(t + 1) - heaviside(t - 3));

y1 = exp(-abs(3*t)/5) .* (heaviside(3*t + 1) - heaviside(3*t - 3));
y2 = exp(-abs(t + 2)/5) .* (heaviside(t + 3) - heaviside(t - 1));
y3 = exp(-abs(4 - 2*t)/5) .* (heaviside(4 - 2*t + 1) - heaviside(4 - 2*t - 3));


figure;
subplot(2, 2, 1);
plot(t, y);
title('y(t)');
xlabel('t');
ylabel('y(t)');

subplot(2, 2, 2);
plot(t, y1);
title('y_1(t) = y(3t)');
xlabel('t');
ylabel('y_1(t)');
```

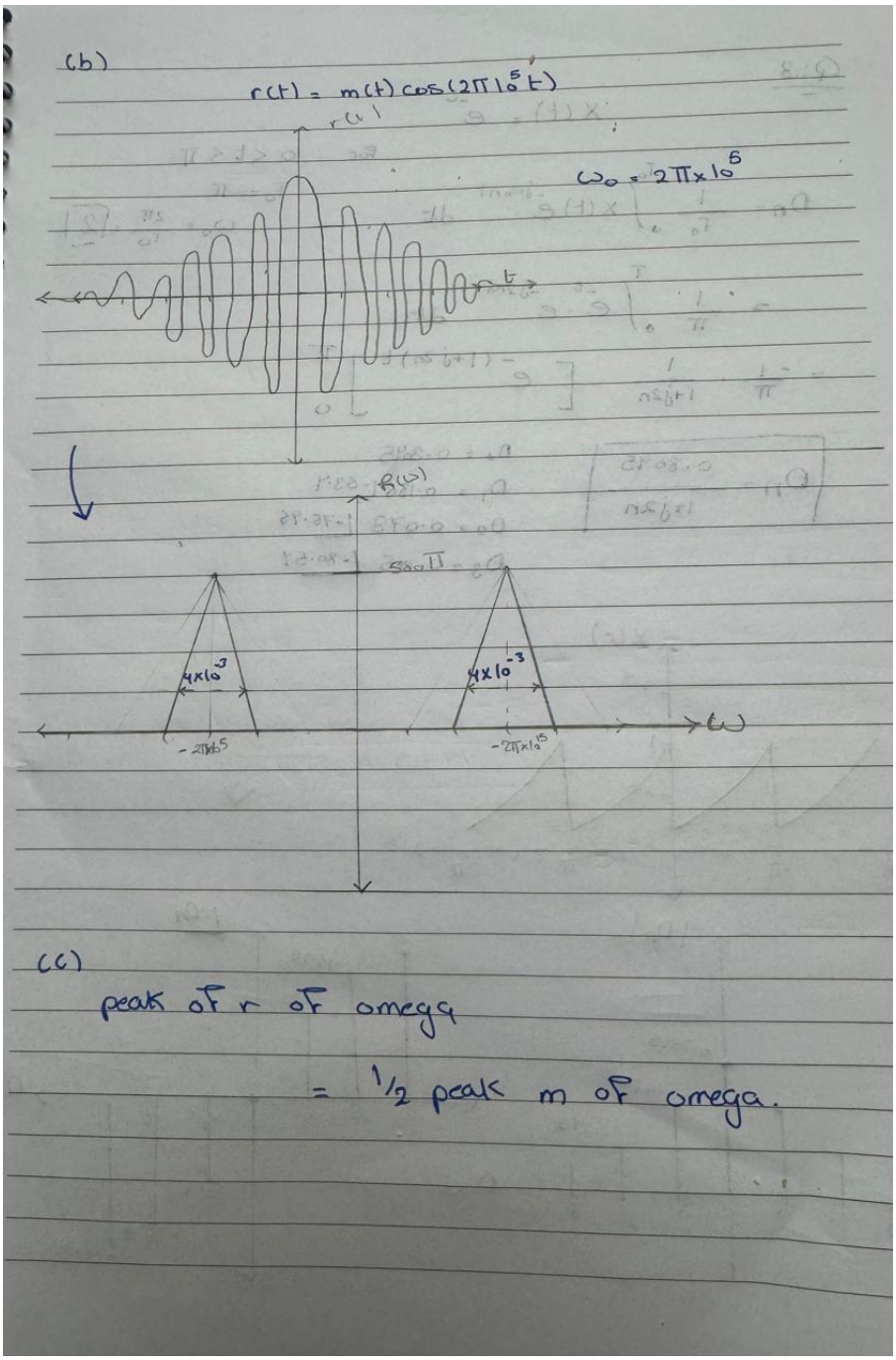
```
subplot(2, 2, 3);
plot(t, y2);
title('y_2(t) = y(t + 2)');
xlabel('t');
ylabel('y_2(t)');

subplot(2, 2, 4);
plot(t, y3);
title('y_3(t) = y(4 - 2t)');
xlabel('t');
ylabel('y_3(t)');
```



Question2

a) Handwritten Solution


Q:2
(a)
$m(t) = \text{sinc}^2(10^{-3}t)$
$m(t)$
t
From table
$\frac{w}{2\pi}\text{sinc}^2\left(\frac{wt}{2}\right) \longrightarrow \Delta\left(\frac{\omega}{2\omega}\right)$
$\text{sinc}^2\left(\frac{\omega t}{2}\right) \longrightarrow \frac{2\pi}{\omega}\Delta\left(\frac{\omega}{2\omega}\right)$ (1)
$m(t) = \sin(10^{-3}t)$ (2)
From (1) & (2) $\longrightarrow$ $\frac{\omega}{2} = 10^{-3}$ $\omega = 2\times10^{-3}$
$M(\omega) = \frac{2\pi}{2\times10^{-3}}\Delta\left(\frac{\omega}{4\times10^{-3}}\right)$
$M(\omega)$
$M(\omega) = 1000\pi\,\Delta\left(\frac{\omega}{4\times10^{-3}}\right)$
1000π
-2×10^{-3}
2×10^{-3}
ω



b) MATLAB Solution

```
t = -0.01:1e-6:0.01;
Ts = t(2) - t(1);
Fs = 1/Ts;

sinc_func = sin(pi * (10^3) .* t) ./ (pi * (10^3) .* t);
sinc_func(isnan(sinc_func)) = 1;

m_t = sinc_func .^ 2;


figure;
plot(t, m_t, 'LineWidth', 1.5);
```

```
title('Signal m(t) = sinc^2(10^{-3}t)');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;

N = length(m_t);
M_f = abs(fftshift(fft(m_t, N))) * Ts;
f = linspace(-Fs/2, Fs/2, N);

figure;
plot(f, M_f, 'LineWidth', 1.5);
title('Magnitude Spectrum |M(\omega)| of m(t)');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
grid on;

fc = 1e5;
carrier = cos(2 * pi * fc * t);
r_t = m_t .* carrier;

figure;
plot(t, r_t, 'LineWidth', 1.5);
title('Modulated Signal r(t) = m(t)cos(2\pi10^5t)');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;

R_f = abs(fftshift(fft(r_t, N))) * Ts;

figure;
plot(f, R_f, 'LineWidth', 1.5);
title('Magnitude Spectrum |R(\omega)| of r(t)');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
grid on;

disp('The spectrum R(\omega) is a shifted version of M(\omega) to +/- fc.');
disp('This is due to the modulation property of the Fourier Transform.');
```

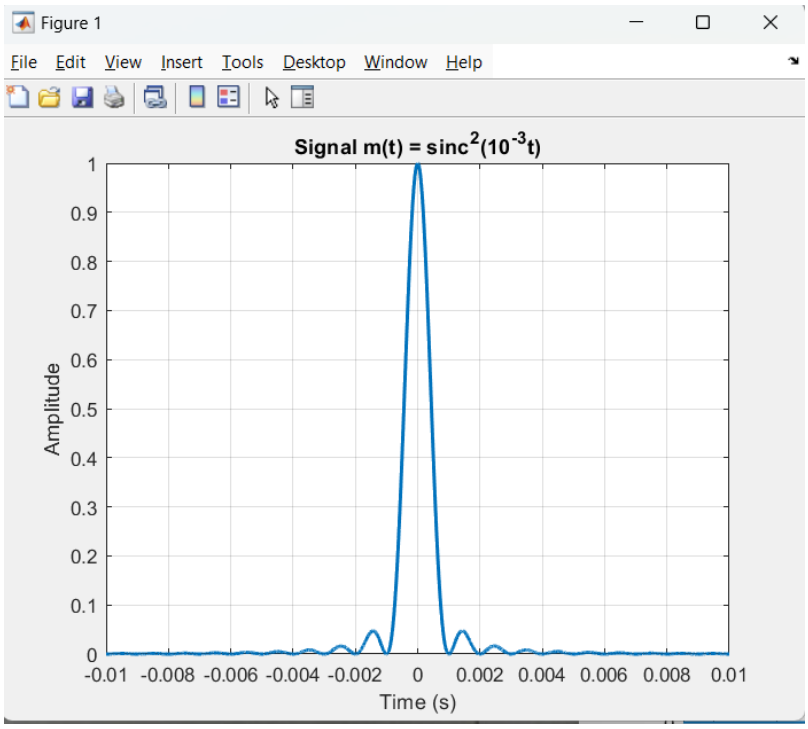


Figure 1
File Edit View Insert Tools Desktop Window Help
Signal m(t) = sinc^2(10^{-3}t)
Amplitude
Time (s)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
-0.01 -0.008 -0.006 -0.004 -0.002 0 0.002 0.004 0.006 0.008 0.01

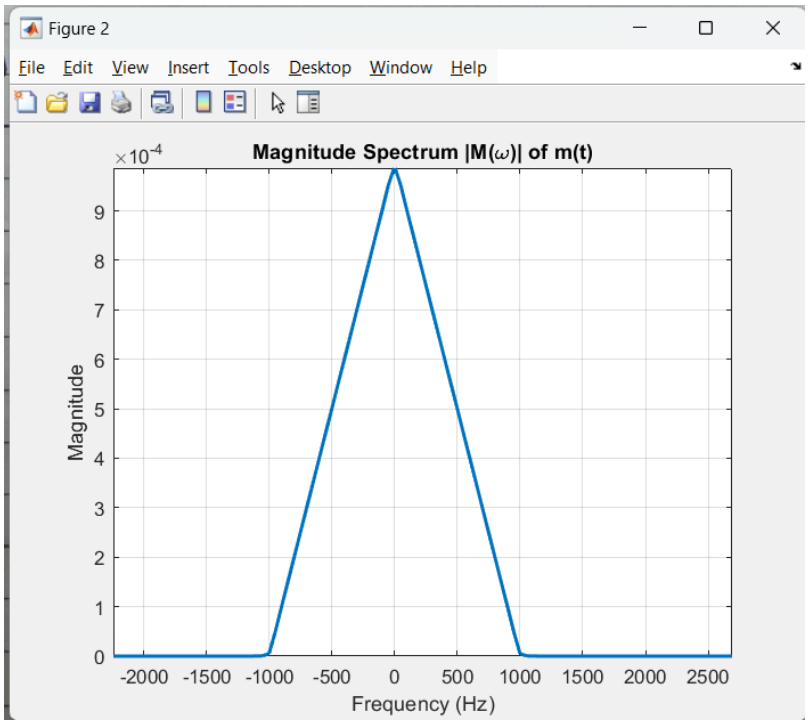
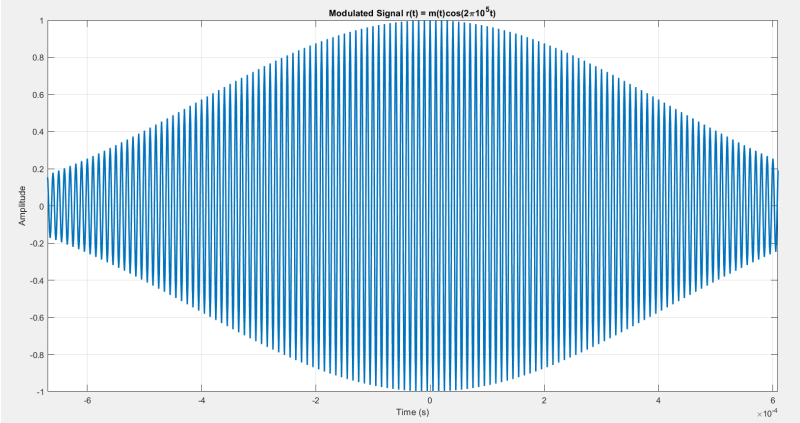
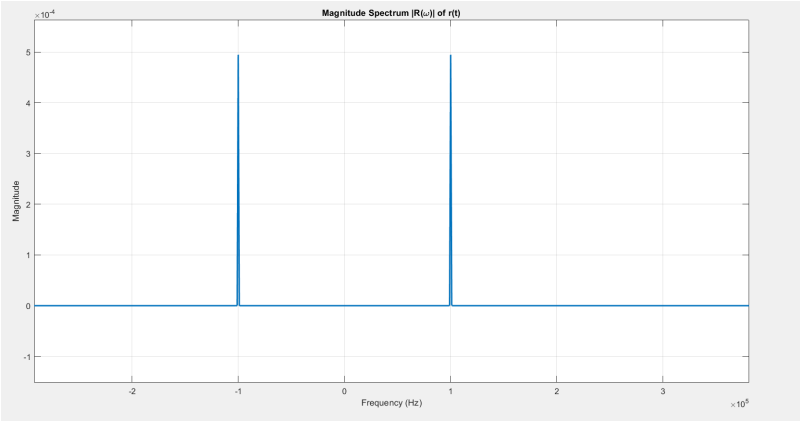


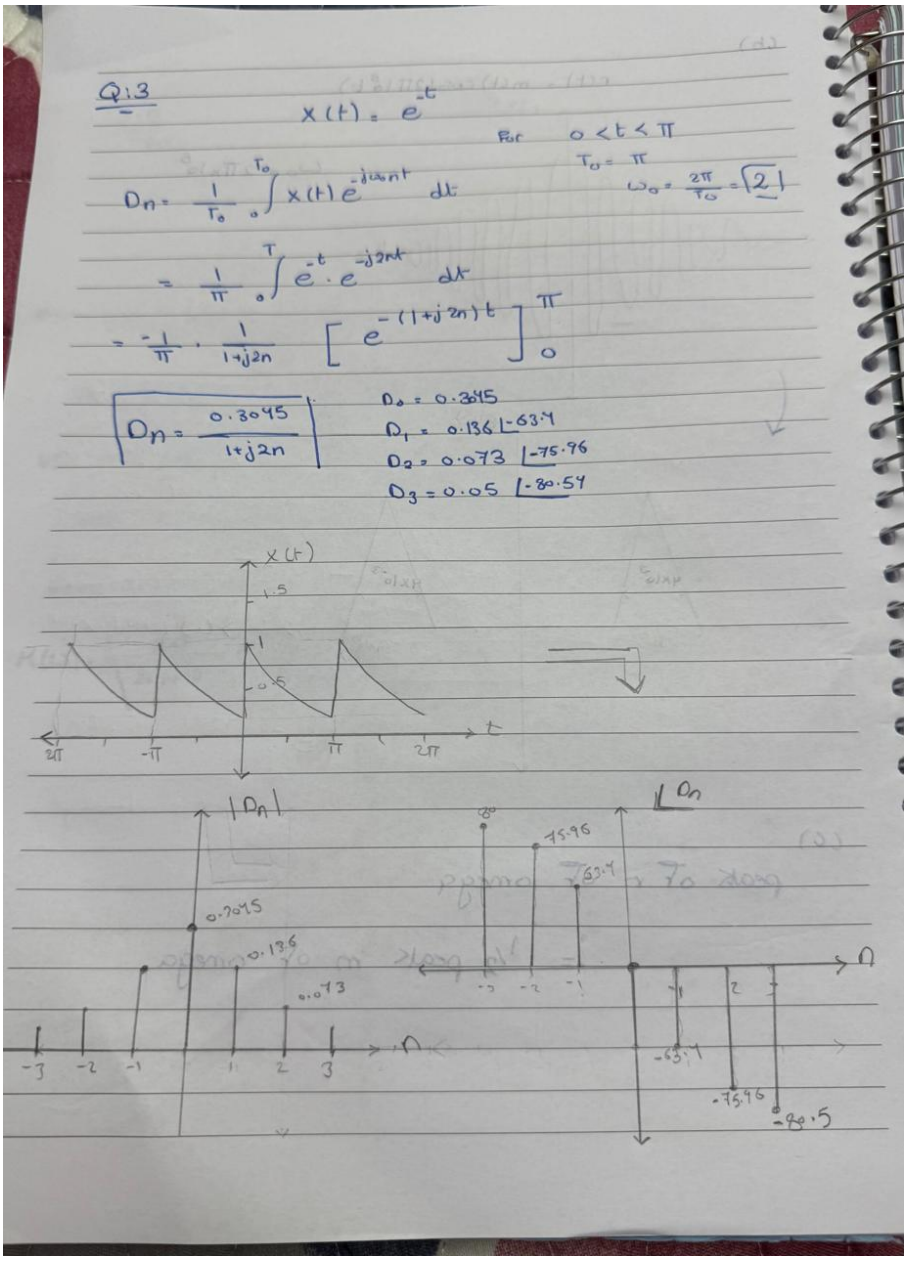
Figure 2
File Edit View Insert Tools Desktop Window Help
Magnitude Spectrum |M(ω)| of m(t)
×10^{-4}
Magnitude
Frequency (Hz)
0 1 2 3 4 5 6 7 8 9
-2000 -1500 -1000 -500 0 500 1000 1500 2000 2500





Question3

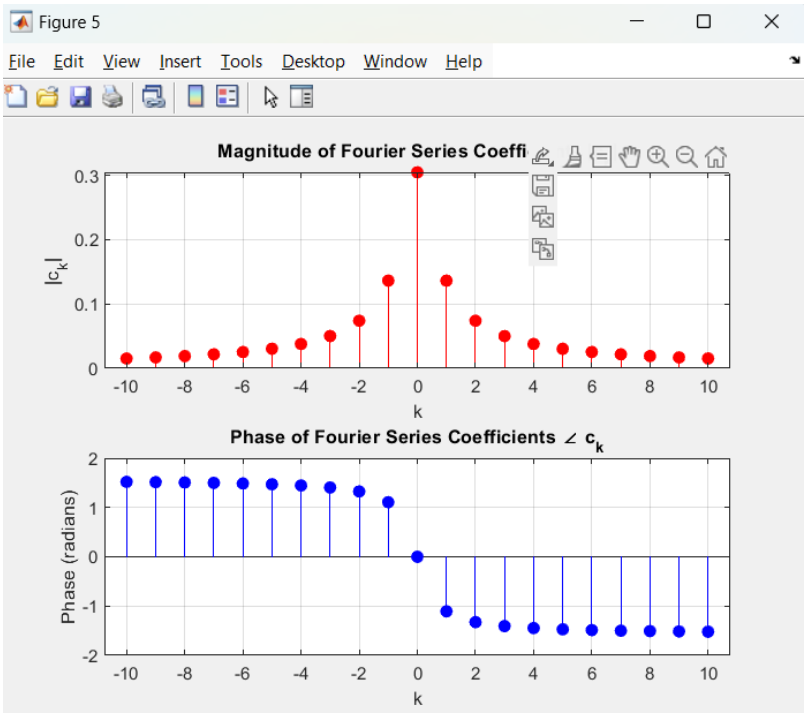
a) Handwritten Solution



b) MATLAB Solution

```
T = pi;
omega0 = 2;
k = -10:10;

ck = zeros(size(k));

for i = 1:length(k)
    k_val = k(i);
    exponent = 1 + 1j * omega0 * k_val;
    numerator = exp(-exponent * T) - 1;
    ck(i) = (1 / T) * (numerator / -exponent);
end

ck_magnitude = abs(ck);
ck_phase = angle(ck);
```

```
figure;

subplot(2,1,1);
stem(k, ck_magnitude, 'filled', 'r');
title('Magnitude of Fourier Series Coefficients |c_k|');
xlabel('k');
ylabel('|c_k|');
grid on;

subplot(2,1,2);
stem(k, ck_phase, 'filled', 'b');
title('Phase of Fourier Series Coefficients \angle c_k');
xlabel('k');
ylabel('Phase (radians)');
grid on;
```



Part II (MATLAB) Signal Gnerator and Analysis

1. Main APP

```
classdef projectApp < matlab.apps.AppBase

    % Properties that correspond to app components
    properties (Access = public)
        UIFigure    matlab.ui.Figure
        Panel       matlab.ui.container.Panel
        editButton  matlab.ui.control.Button
        DrawButton  matlab.ui.control.Button
        UIAxes      matlab.ui.control.UIAxes
    end
```

```
    methods (Access = private)
        function DCsignal(app,startTime,endTime,Amp,samplingFreq)
            t = linspace(startTime , endTime , samplingFreq*(endTime-startTime)) ;
            y = Amp*ones(1,samplingFreq*(endTime-startTime)) ;
            plot(app.UIAxes,t,y,"b") ;
            hold(app.UIAxes ,'on') ;
            oldvect = evalin('base','SignalVector') ;
            newVect = [oldvect , y];
            assignin('base',"SignalVector",newVect);
            % xlim(app.UIAxes, [startTime endTime]);
        end
        function Rampsignal(app,startTime,endTime,Amp,c,samplingFreq)
            t = linspace(startTime , endTime , samplingFreq*(endTime-startTime)) ;
            y = Amp*t + c ;
            plot(app.UIAxes,t,y,"b") ;
            hold(app.UIAxes ,'on') ;
            oldvect = evalin('base','SignalVector') ;
            newVect = [oldvect , y];
            assignin('base',"SignalVector",newVect);
            % xlim(app.UIAxes, [startTime endTime]);
        end
        function Exposignal(app,startTime,endTime,Amp,pow,samplingFreq)
            t = linspace(startTime , endTime , samplingFreq*(endTime-startTime)) ;
            y = Amp*exp(pow*t) ;
            plot(app.UIAxes,t,y,"b") ;
            hold(app.UIAxes ,'on') ;
            oldvect = evalin('base','SignalVector') ;
            newVect = [oldvect , y];
            assignin('base',"SignalVector",newVect);
            % xlim(app.UIAxes, [startTime endTime]);
        end
        function sinsignal(app,startTime,endTime,Amp,freq,phase,samplingFreq)
            t = linspace(startTime , endTime , samplingFreq*(endTime-startTime)) ;
            y = Amp*cos(freq*t+phase);
            plot(app.UIAxes,t,y,"b") ;
            hold(app.UIAxes ,'on') ;
            oldvect = evalin('base','SignalVector') ;
            newVect = [oldvect , y];
            assignin('base',"SignalVector",newVect);
            % xlim(app.UIAxes, [startTime endTime]);
        end
        function polysignal(app,startTime,endTime,Amp,pow,c,samplingFreq)
            t = linspace(startTime , endTime , samplingFreq*(endTime-startTime)) ;
            y = Amp*t.^pow + c;
            plot(app.UIAxes,t,y,"b") ;
            hold(app.UIAxes ,'on') ;
            oldvect = evalin('base','SignalVector') ;
            newVect = [oldvect , y];
            assignin('base',"SignalVector",newVect);
            % xlim(app.UIAxes, [startTime endTime]);
        end

        function amplituideScale(app,amp)
```

```
            hold(app.UIAxes ,'off') ;
            oldvect = evalin('base','SignalVector') ;
            oldvect = amp*oldvect;

            oldvectTime = evalin('base','SignalVectorTime') ;
            plot(app.UIAxes,oldvectTime,oldvect,"r") ;

            assignin('base',"SignalVector",oldvect);
            assignin('base',"SignalVectorTime",oldvectTime);


        end
        function  timeShift(app,value)
            hold(app.UIAxes ,'off') ;
            oldvect = evalin('base','SignalVector') ;
            oldvectTime = evalin('base','SignalVectorTime') ;
            oldvectTime= oldvectTime+value;

            plot(app.UIAxes,oldvectTime,oldvect,"r") ;

            assignin('base',"SignalVector",oldvect);
            assignin('base',"SignalVectorTime",oldvectTime);


        end
          function  timeReversal(app)
            hold(app.UIAxes ,'off') ;
            oldvect = evalin('base','SignalVector') ;
            oldvectTime = evalin('base','SignalVectorTime') ;
            oldvectTime= -oldvectTime;

            plot(app.UIAxes,oldvectTime,oldvect,"r") ;

            assignin('base',"SignalVector",oldvect);
            assignin('base',"SignalVectorTime",oldvectTime);


          end
           function  compress(app,value)
            hold(app.UIAxes ,'off') ;
            oldvect = evalin('base','SignalVector') ;
            oldvectTime = evalin('base','SignalVectorTime') ;
            oldvectTime= value*oldvectTime;

            plot(app.UIAxes,oldvectTime,oldvect,"r") ;

            assignin('base',"SignalVector",oldvect);
            assignin('base',"SignalVectorTime",oldvectTime);


           end
           function  expand(app,value)
            hold(app.UIAxes ,'off') ;
            oldvect = evalin('base','SignalVector') ;
```

```
            oldvectTime = evalin('base','SignalVectorTime') ;
            oldvectTime= value*oldvectTime;

            plot(app.UIAxes,oldvectTime,oldvect,"r") ;

            assignin('base',"SignalVector",oldvect);
            assignin('base',"SignalVectorTime",oldvectTime);


        end
    end


    % Callbacks that handle component events
    methods (Access = private)

        % Button pushed function: DrawButton
        function DrawButtonPushed(app, event)
            dlgtitle = 'User Input';
            dims = [1 50]; % 1 line, 50 characters width
            definput = {''}; % Default input value

            prompt = {'Enter the sampling frequency of the signal'};
            sampling_freq = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

            prompt = {'Enter the start time of the signal'};
            start_time = str2double(inputdlg(prompt, dlgtitle, dims, definput));

            prompt = {'Enter the end time of the signal'};
            end_time = str2double(inputdlg(prompt, dlgtitle, dims, definput));

            allTime = linspace(start_time,end_time,(end_time-
start_time)*sampling_freq)
            assignin('base',"SignalVectorTime",allTime);

            prompt = {'Enter the number of break points of the signal'};
            break_points_number = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

            prompt = {'Enter the break points of the signal (comma separated)'};
            break_points = inputdlg(prompt, dlgtitle, dims, definput);
            break_points_ints = str2double(split(break_points, ','))% Replace
commas with space
            break_points_ints = [start_time break_points_ints' end_time]

            assignin('base',"SignalVector",0);

            counter = 1 ;

            while counter <= length(break_points_ints)-1
                builder = buildingSignal();
                waitfor(builder) ;
                result = evalin('base','result') ;
```

```
                disp(result)


                if (strcmp(result,"DC"))
                    prompt = {'Enter the Amplitude'};
                    Amplitude = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
                    DCsignal(app,break_points_ints(counter)
,break_points_ints(counter+1),Amplitude,sampling_freq)
                elseif(strcmp(result,"Exponential"))
                    prompt = {'Enter the Amplitude'};
                    Amplitude = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                    prompt = {'Enter the exponent'};
                    Exponent = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                    Exposignal(app,break_points_ints(counter)
,break_points_ints(counter+1),Amplitude,Exponent,sampling_freq);
                elseif(strcmp(result,"Sinusoidal"))
                    prompt = {'Enter the Amplitude'};
                    Amplitude = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                    prompt = {'Enter the frequency'};
                    frequency = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                    prompt = {'Enter the phase'};
                    phase = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                    sinsignal(app,break_points_ints(counter)
,break_points_ints(counter+1),Amplitude,frequency,phase,sampling_freq)
                elseif(strcmp(result,"Ramp"))
                     prompt = {'Enter the Slope'};
                     Slope = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                     prompt = {'Enter the intercept'};
                     intercept = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                     Rampsignal(app,break_points_ints(counter)
,break_points_ints(counter+1),Slope ,intercept ,sampling_freq )
                elseif(strcmp(result,"Polynomial"))
                     prompt = {'Enter the power'};
                     power = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                     prompt = {'Enter the intercept'};
                     intercept = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
```

```
                    prompt = {'Enter the Amplituide'};
                    Amplitude = str2double(inputdlg(prompt, dlgtitle, dims,
definput));

                   polysignal(app,break_points_ints(counter)
,break_points_ints(counter+1),Amplitude,power,intercept,sampling_freq)
                end

            counter = counter + 1 ;

            end

        hold(app.UIAxes ,'off') ;
        oldvect = evalin('base','SignalVector') ;
        plot(app.UIAxes,allTime,oldvect(2:end),"r") ;
        assignin('base',"SignalVector",oldvect(2:end));


        end

        % Button pushed function: editButton
        function editButtonPushed(app, event)
            dlgtitle = 'User Input';
            dims = [1 50]; % 1 line, 50 characters width
            definput = {''}; % Default input value
            editWindow = editSignal();
            waitfor(editWindow);
            result = evalin('base','operation') ;
            disp(result);
            if(strcmp(result,"Amplituide Scaling"))
               prompt = {'Enter the Scale'};
               valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
               amplituideScale(app,valueOfoperation);
            elseif(strcmp(result,"Time reversal"))
               timeReversal(app);
            elseif(strcmp(result,"Compression"))
                prompt = {'Enter the value'};
                valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
            while valueOfoperation>1
              prompt = {'Enter value smaller than 1'};
              valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
            end
             compress(app,valueOfoperation);
            elseif(strcmp(result,"Time shift"))
             prompt = {'Enter the value'};
            valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
            timeShift(app,valueOfoperation);

            elseif(strcmp(result,"Expansion"))
```

```
             prompt = {'Enter the value'};
            valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
            while valueOfoperation<1
            prompt = {'Enter value greater than 1'};
            valueOfoperation = str2double(inputdlg(prompt, dlgtitle, dims,
definput));
            end
            expand(app,valueOfoperation);
            elseif(strcmp(result,"none"))
            end



        end
    end

    % Component initialization
    methods (Access = private)

        % Create UIFigure and components
        function createComponents(app)

            % Create UIFigure and hide until all components are created
            app.UIFigure = uifigure('Visible', 'off');
            app.UIFigure.Position = [100 100 640 480];
            app.UIFigure.Name = 'MATLAB App';

            % Create UIAxes
            app.UIAxes = uiaxes(app.UIFigure);
            title(app.UIAxes, 'Signal')
            xlabel(app.UIAxes, 'Time')
            ylabel(app.UIAxes, 'f(t)')
            zlabel(app.UIAxes, 'Z')
            app.UIAxes.XGrid = 'on';
            app.UIAxes.YGrid = 'on';
            app.UIAxes.Position = [16 169 589 274];

            % Create Panel
            app.Panel = uipanel(app.UIFigure);
            app.Panel.Title = 'Panel';
            app.Panel.Position = [16 42 150 85];

            % Create DrawButton
            app.DrawButton = uibutton(app.Panel, 'push');
            app.DrawButton.ButtonPushedFcn = createCallbackFcn(app,
@DrawButtonPushed, true);
            app.DrawButton.Position = [15 38 100 22];
            app.DrawButton.Text = 'Draw';

            % Create editButton
            app.editButton = uibutton(app.Panel, 'push');
            app.editButton.ButtonPushedFcn = createCallbackFcn(app,
@editButtonPushed, true);
```

```
            app.editButton.Position = [16 4 100 22];
            app.editButton.Text = 'edit';

            % Show the figure after all components are created
            app.UIFigure.Visible = 'on';
        end
    end

    % App creation and deletion
    methods (Access = public)

        % Construct app
        function app = projectApp

            % Create UIFigure and components
            createComponents(app)

            % Register the app with App Designer
            registerApp(app, app.UIFigure)

            if nargout == 0
                clear app
            end
        end

        % Code that executes before app deletion
        function delete(app)

            % Delete UIFigure when app is deleted
            delete(app.UIFigure)
        end
    end
end
```

2. Building Signal

```
classdef buildingSignal < matlab.apps.AppBase

    % Properties that correspond to app components
    properties (Access = public)
        UIFigure                        matlab.ui.Figure
        doneButton                      matlab.ui.control.Button
        ChooseSignalTypeDropDown        matlab.ui.control.DropDown
        ChooseSignalTypeDropDownLabel   matlab.ui.control.Label
    end




    % Callbacks that handle component events
    methods (Access = private)
```

```
        % Value changed function: ChooseSignalTypeDropDown
        function ChooseSignalTypeDropDownValueChanged(app, event)
           % Update the output value when the dropdown value changes
            value = app.ChooseSignalTypeDropDown.Value;
            assignin('base',"result",value)

        end

        % Button pushed function: doneButton
        function doneButtonPushed(app, event)

            delete(app);  % Close the window
        end
    end

    % Component initialization
    methods (Access = private)

        % Create UIFigure and components
        function createComponents(app)

            % Create UIFigure and hide until all components are created
            app.UIFigure = uifigure('Visible', 'off');
            app.UIFigure.Position = [100 100 308 115];
            app.UIFigure.Name = 'MATLAB App';

            % Create ChooseSignalTypeDropDownLabel
            app.ChooseSignalTypeDropDownLabel = uilabel(app.UIFigure);
            app.ChooseSignalTypeDropDownLabel.HorizontalAlignment = 'right';
            app.ChooseSignalTypeDropDownLabel.Position = [11 29 112 22];
            app.ChooseSignalTypeDropDownLabel.Text = 'Choose Signal Type';

            % Create ChooseSignalTypeDropDown
            app.ChooseSignalTypeDropDown = uidropdown(app.UIFigure);
            app.ChooseSignalTypeDropDown.Items = {'DC', 'Ramp', 'Polynomial',
'Exponential', 'Sinusoidal', 'choose'};
            app.ChooseSignalTypeDropDown.ValueChangedFcn = createCallbackFcn(app,
@ChooseSignalTypeDropDownValueChanged, true);
            app.ChooseSignalTypeDropDown.Position = [138 29 100 22];
            app.ChooseSignalTypeDropDown.Value = 'choose';

            % Create doneButton
            app.doneButton = uibutton(app.UIFigure, 'push');
            app.doneButton.ButtonPushedFcn = createCallbackFcn(app,
@doneButtonPushed, true);
            app.doneButton.Position = [237 8 62 22];
            app.doneButton.Text = 'done';

            % Show the figure after all components are created
            app.UIFigure.Visible = 'on';
        end
    end

    % App creation and deletion
```

```
    methods (Access = public)

        % Construct app
        function app = buildingSignal

            % Create UIFigure and components
            createComponents(app)

            % Register the app with App Designer
            registerApp(app, app.UIFigure)

            if nargout == 0
                clear app
            end
        end

        % Code that executes before app deletion
        function delete(app)

            % Delete UIFigure when app is deleted
            delete(app.UIFigure)
        end
    end
end
```

3. Edit Signal

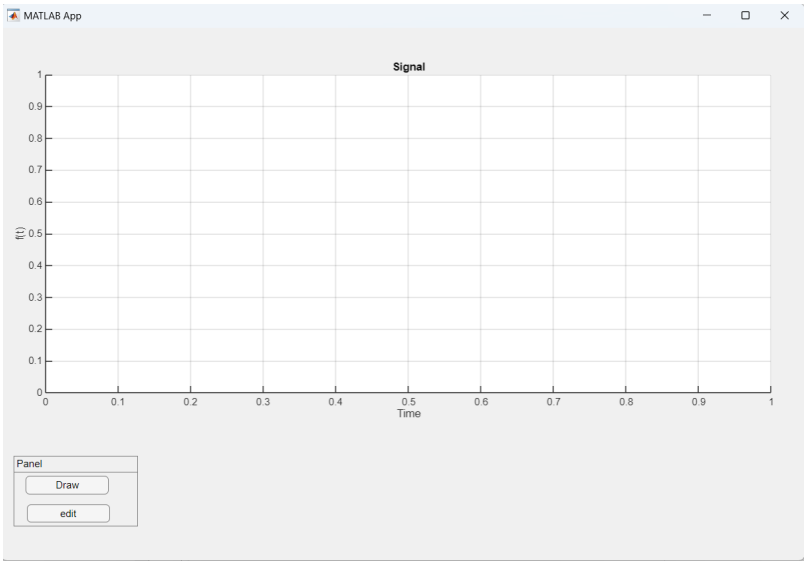
```
classdef editSignal < matlab.apps.AppBase

    % Properties that correspond to app components
    properties (Access = public)
        UIFigure                    matlab.ui.Figure
        chooseasignalDropDown       matlab.ui.control.DropDown
        chooseasignalDropDownLabel  matlab.ui.control.Label
        DoneButton                  matlab.ui.control.Button
    end

    % Callbacks that handle component events
    methods (Access = private)

        % Button pushed function: DoneButton
        function DoneButtonPushed(app, event)
            delete(app);
        end

        % Value changed function: chooseasignalDropDown
        function chooseasignalDropDownValueChanged(app, event)
            value = app.chooseasignalDropDown.Value;
            assignin('base','operation',value);
        end
    end
```

```
    % Component initialization
    methods (Access = private)

        % Create UIFigure and components
        function createComponents(app)

            % Create UIFigure and hide until all components are created
            app.UIFigure = uifigure('Visible', 'off');
            app.UIFigure.Position = [100 100 263 167];
            app.UIFigure.Name = 'MATLAB App';

            % Create DoneButton
            app.DoneButton = uibutton(app.UIFigure, 'push');
            app.DoneButton.ButtonPushedFcn = createCallbackFcn(app,
@DoneButtonPushed, true);
            app.DoneButton.Position = [149 15 100 22];
            app.DoneButton.Text = 'Done ';

            % Create chooseasignalDropDownLabel
            app.chooseasignalDropDownLabel = uilabel(app.UIFigure);
            app.chooseasignalDropDownLabel.HorizontalAlignment = 'right';
            app.chooseasignalDropDownLabel.Position = [33 73 88 22];
            app.chooseasignalDropDownLabel.Text = 'choose a signal';

            % Create chooseasignalDropDown
            app.chooseasignalDropDown = uidropdown(app.UIFigure);
            app.chooseasignalDropDown.Items = {'choose', 'Amplituide Scaling',
'Time shift', 'Time reversal', 'Compression', 'Expansion'};
            app.chooseasignalDropDown.ValueChangedFcn = createCallbackFcn(app,
@chooseasignalDropDownValueChanged, true);
            app.chooseasignalDropDown.Position = [132 73 100 22];
            app.chooseasignalDropDown.Value = 'choose';

            % Show the figure after all components are created
            app.UIFigure.Visible = 'on';
        end
    end

    % App creation and deletion
    methods (Access = public)

        % Construct app
        function app = editSignal

            % Create UIFigure and components
            createComponents(app)

            % Register the app with App Designer
            registerApp(app, app.UIFigure)

            if nargout == 0
                clear app
            end
        end
```

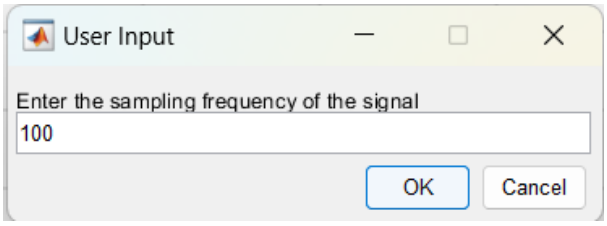
```
        % Code that executes before app deletion
        function delete(app)

            % Delete UIFigure when app is deleted
            delete(app.UIFigure)
        end
    end
end
```

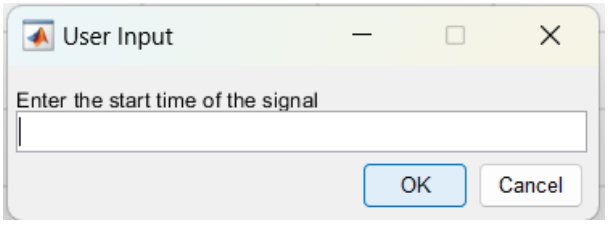
using the app

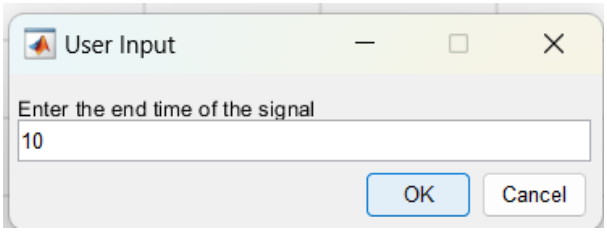
> Lets open the app

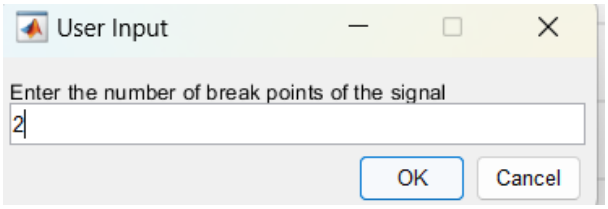


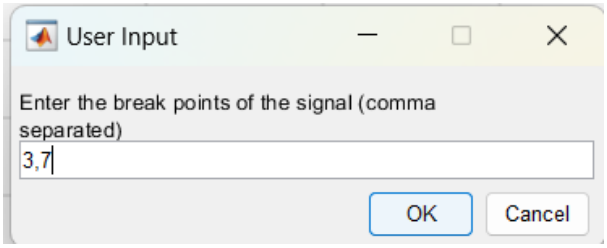
> Now lets draw we enter the sample frequency and the start and end time and break points



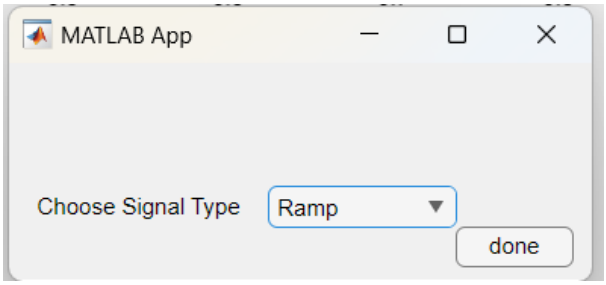


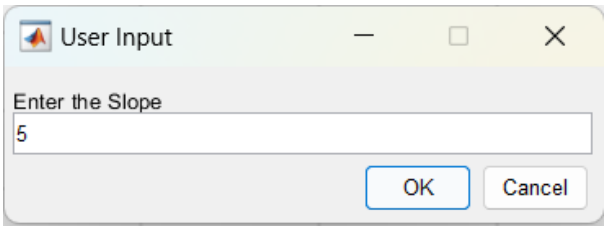


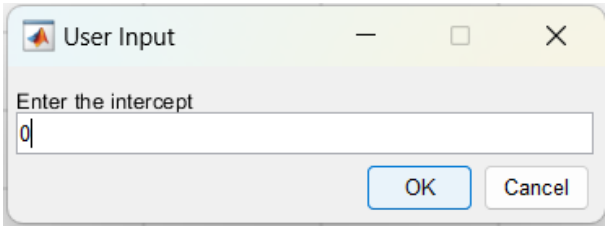




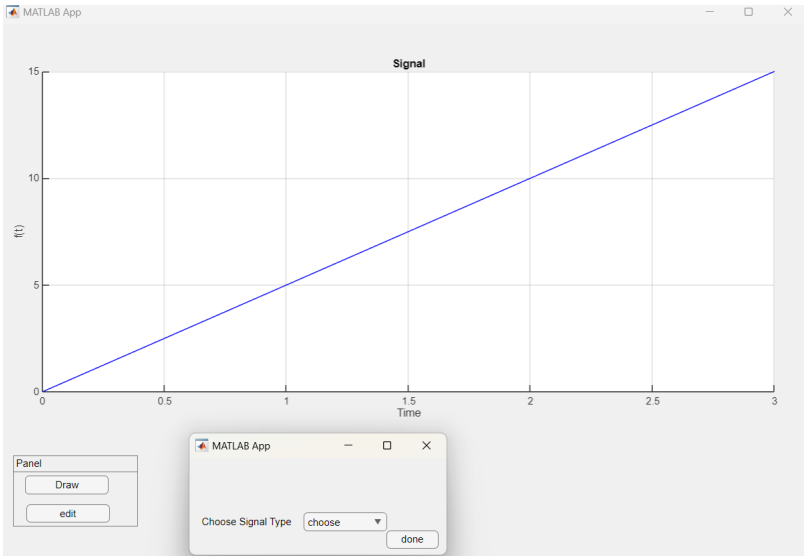
> Now lets build the signal a dialog will appear to choose the type of the signal and its parameters at first lets create a ramp (slope and intercept are needed)



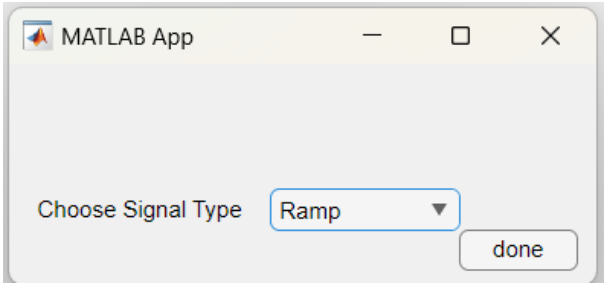


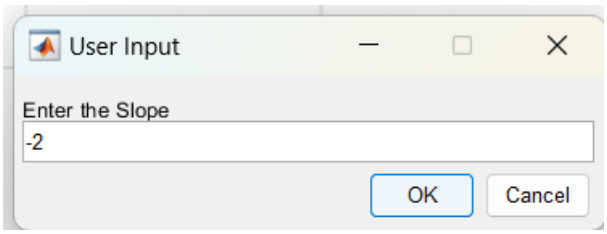


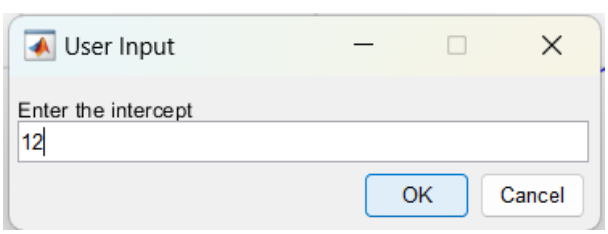
> Now the program plots the first part



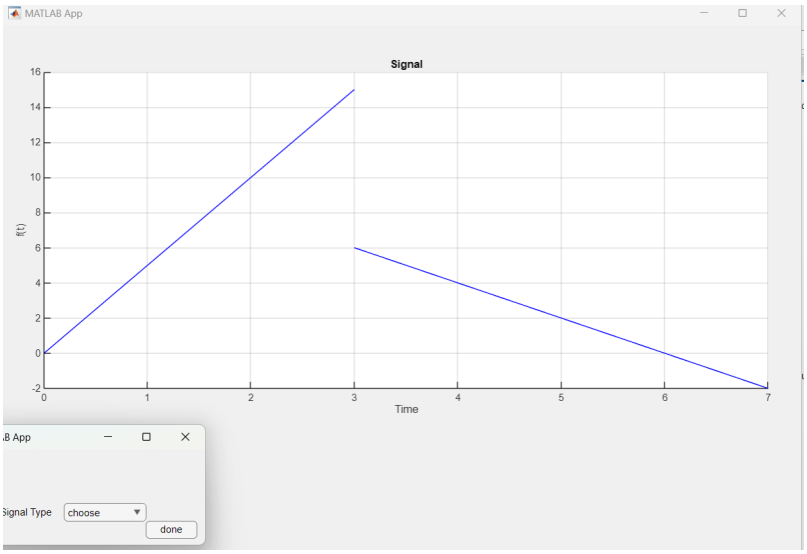
> A new dialog pops again to choose the set the second region it's also a ramp



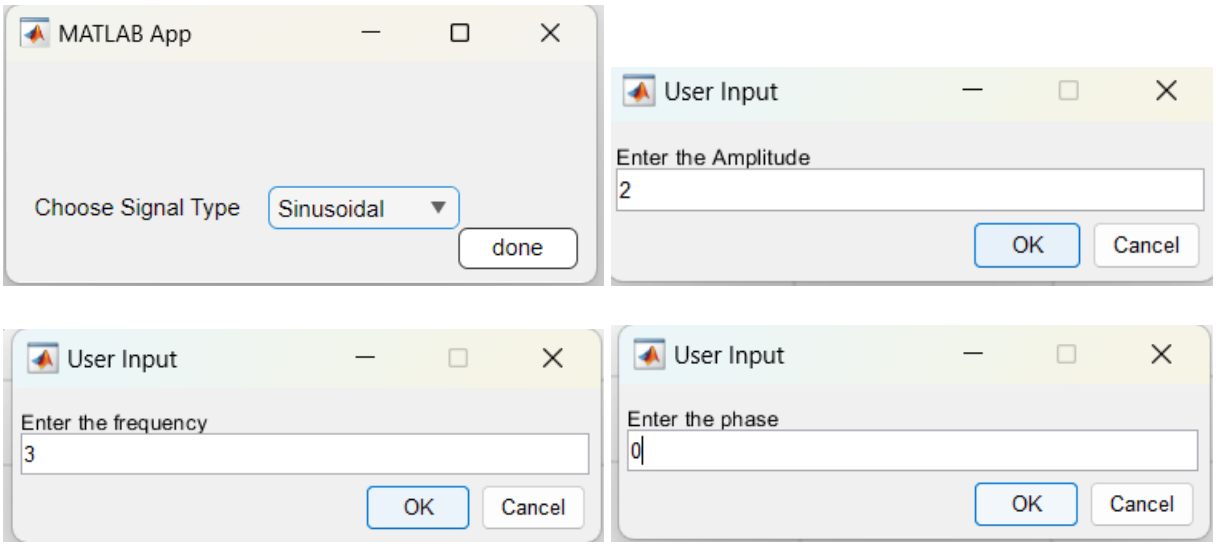




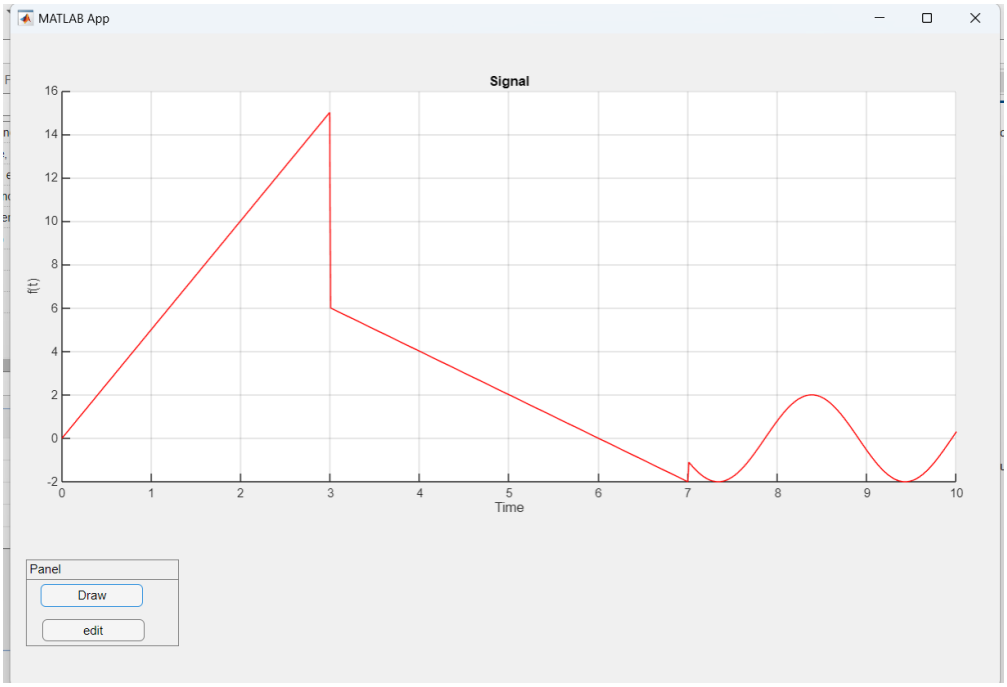
> The new region is now plotted beside the old one



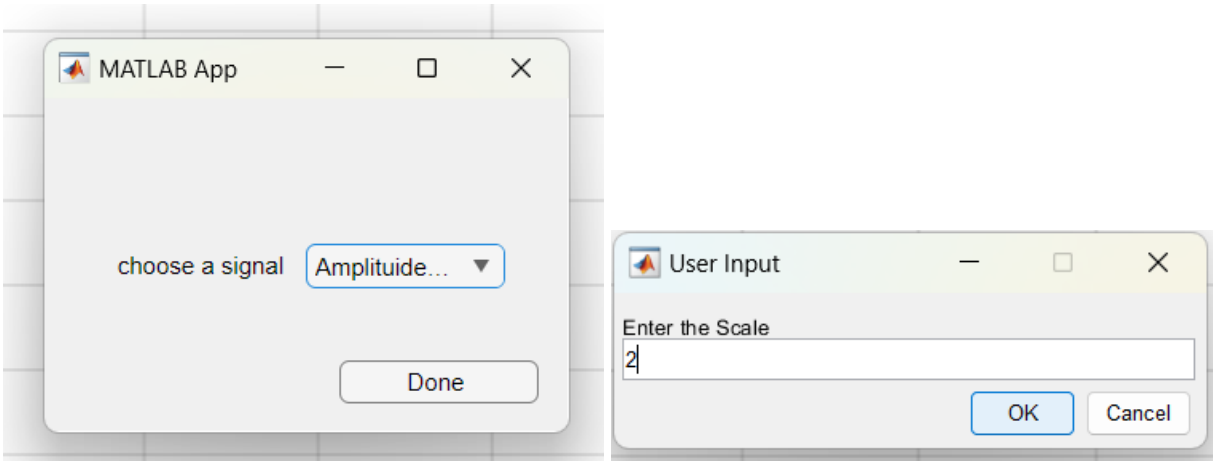
> Now lets add the last region which will be a sine wave with amplitude frequency and phase



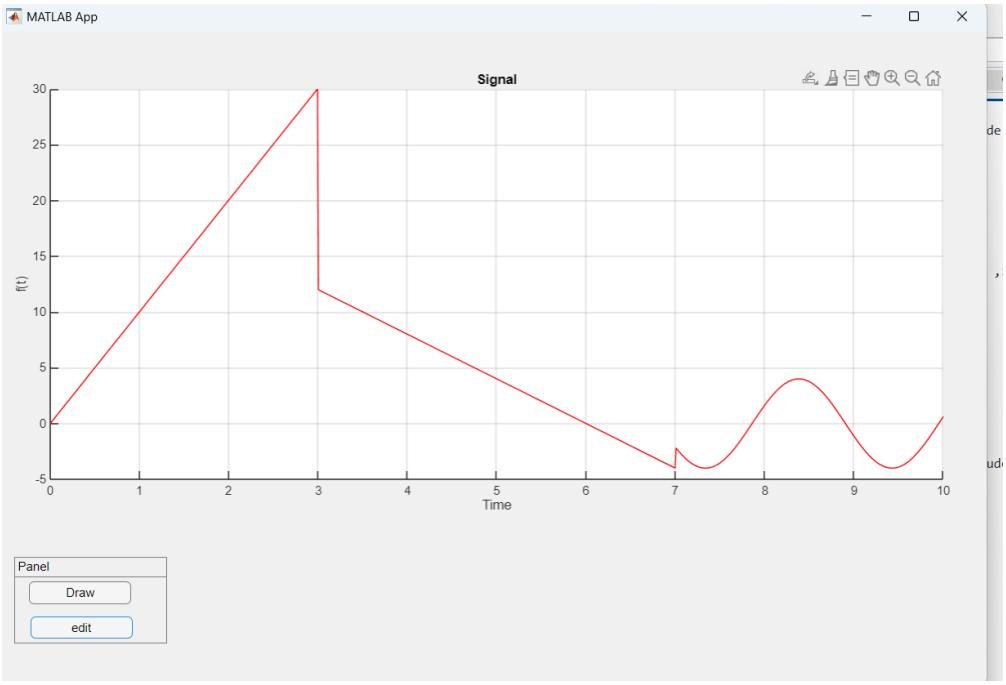
> The final signal is plotted now



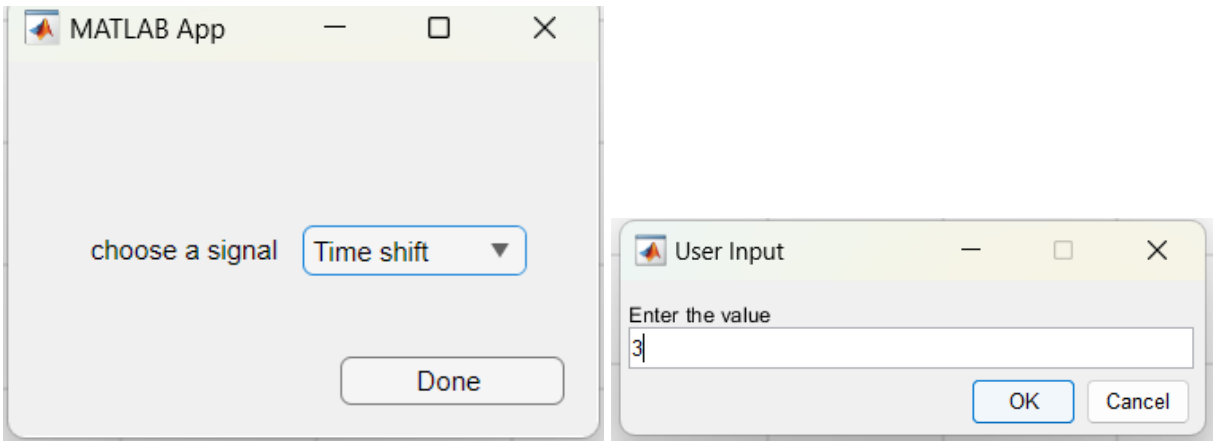
> Now lets edit the signal we can choose to scale the amplitude, time shift, time reversal, compress or expand the signal first scaling



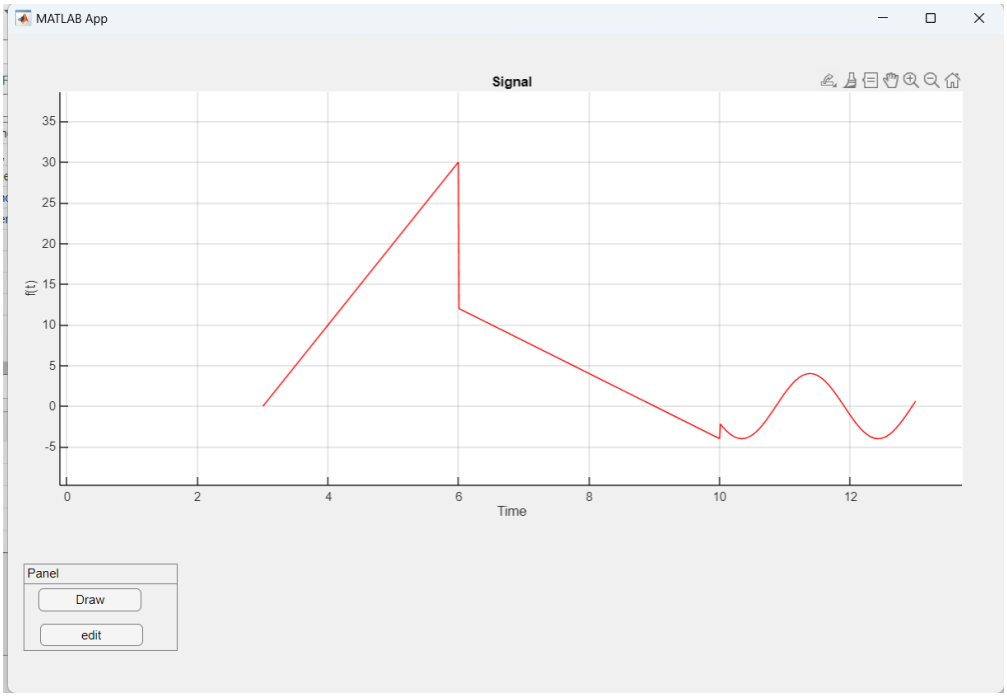
> The signal is now scaled



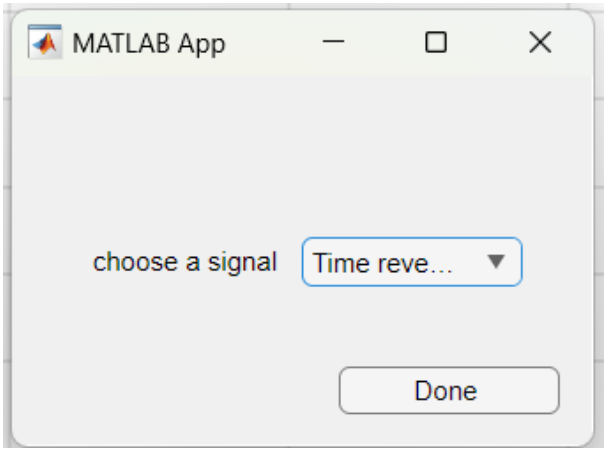
> Now lets time shift the signal



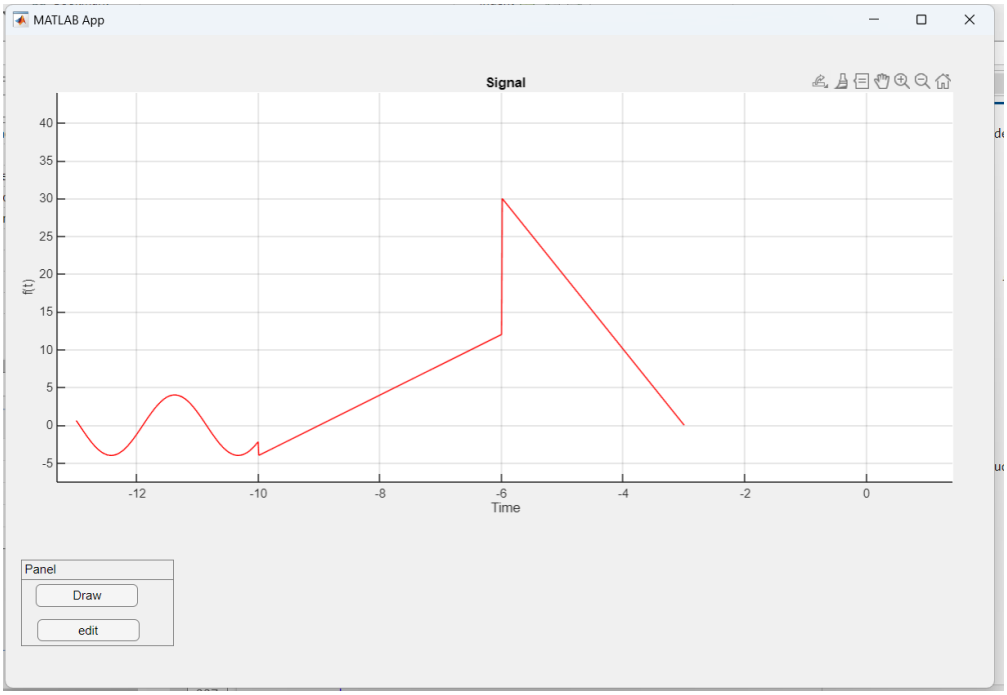
> The signal is now shifted



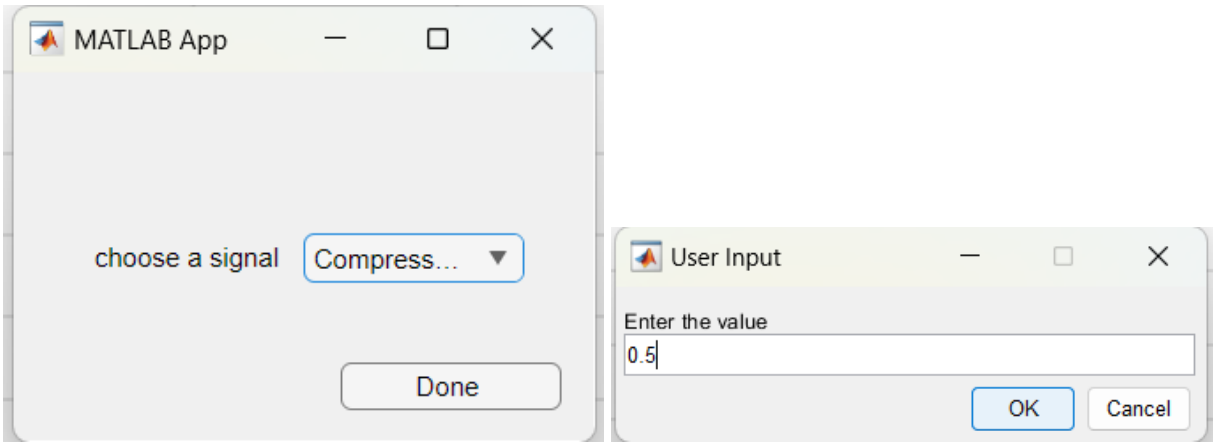
Now lets time reverse the signal



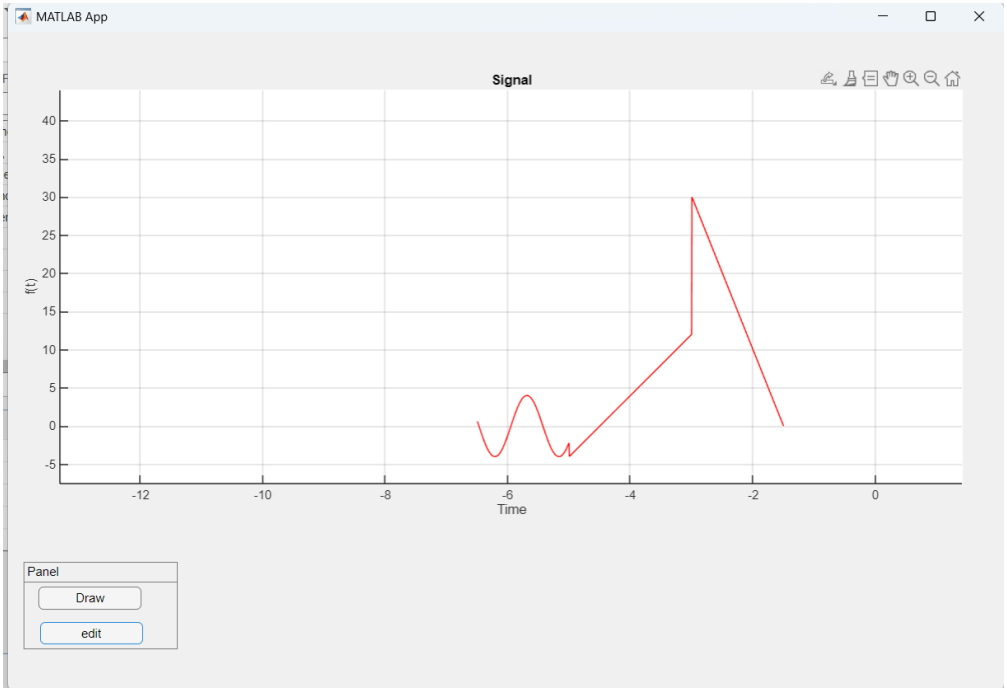
The signal is now reversed



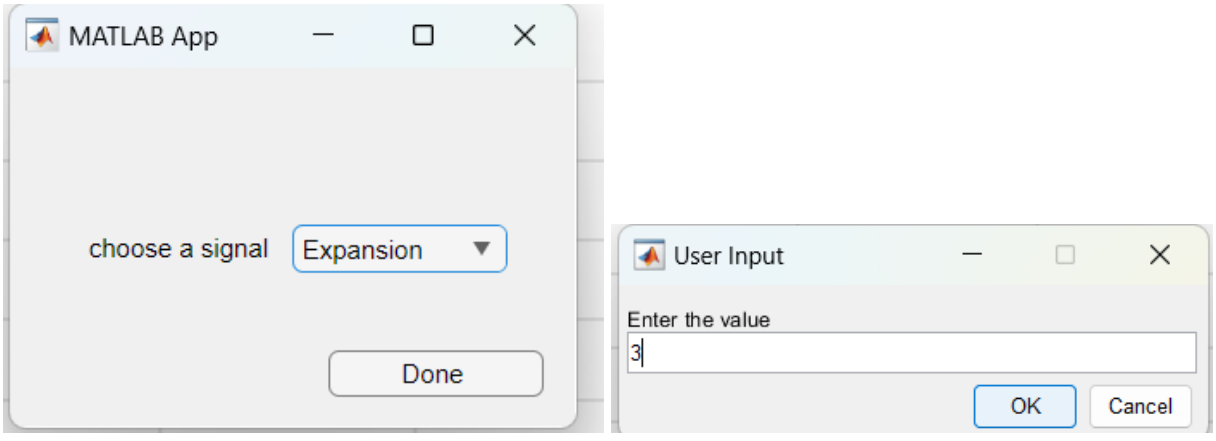
Now lets compress the signal



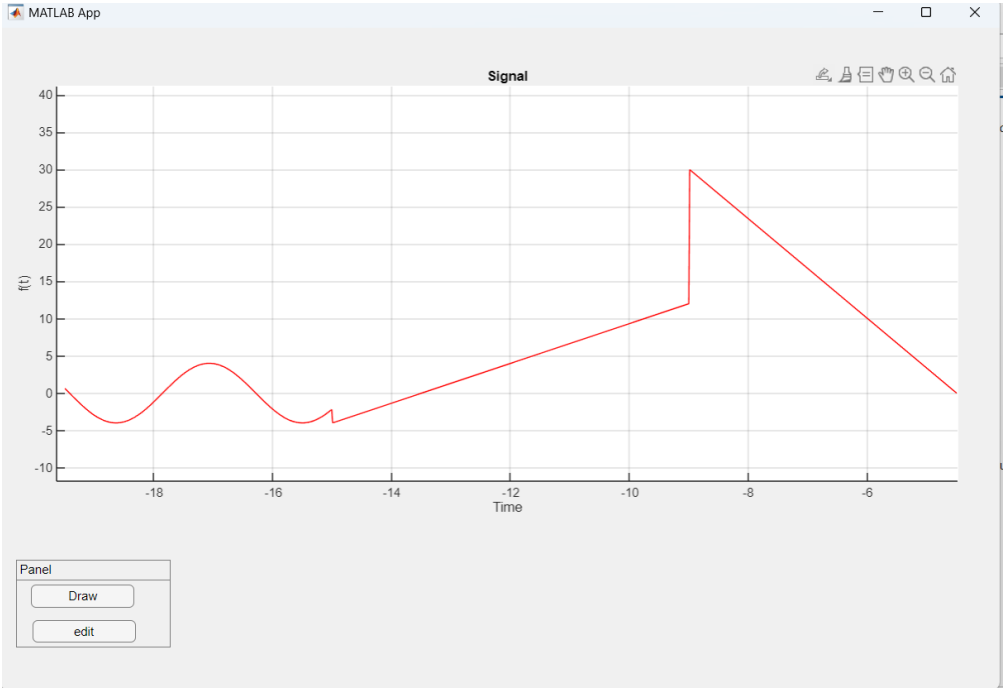
The signal is now compressed



Now lets expand the signal



The signal is now expanded



The app is now ready to use and can be used to generate and edit signals

The link for the repo for the project is Repo

The link for the drive for more videos Drive