

Signals and Systems

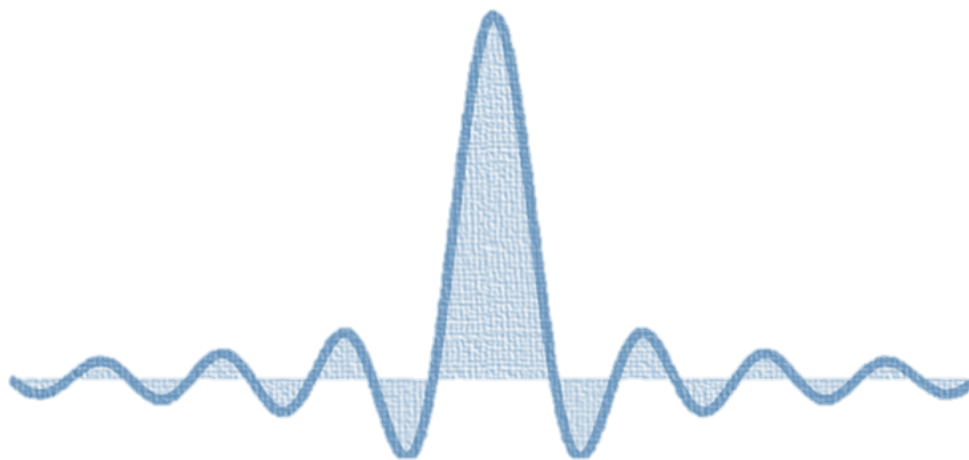
Signal Generator Project

MATLAB Simulation

Code and Sample Runs

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Code:

```

clc;
clear;
close all;
fs= input('Please enter the sampling frequency required: ');
start_time=input('Please enter signal starting time: ');
end_time=input('Please enter signal end time: ');
break_points_number=input('please enter number of break points: ');
information_array= zeros(break_points_number+1,2);
information_array(1,1)=start_time;
information_array(break_points_number+1,2)=end_time;
for i=0:1:(break_points_number-1)
    information_array(i+1,2)=input(['Please enter break point
#',int2str(i+1), ' position: ']);
    information_array(i+2,1)=information_array(i+1,2);
end

t_tot=[];
y_tot=[];
tempPoly=[];
for i=0:1:(break_points_number)

t=linspace(information_array(i+1,1),information_array(i+1,2),fs*abs(inform
ation_array(i+1,2)-information_array(i+1,1)));
    function_type=input(['\nPlease enter the type of the function in
position ',num2str(information_array(i+1,1)),': ',
num2str(information_array(i+1,2)), '\n1.DC Signal\n2.Ramp
Signal\n3.General Order Polynomial\n4.Exponential Signal\n5.Sinusoidal
Signal\n\nFunction type: ']);
    if function_type==1
        DC_Amplitude=input('Please enter signal amplitude: ');
        y = DC_Amplitude*ones(1,fs*abs(information_array(i+1,2)-
information_array(i+1,1)));
    elseif function_type==2
        Ramp_Slope=input('Please enter the slope: ');
        Ramp_Intercept=input('Please enter the intercept: ');
        y = Ramp_Slope * t + Ramp_Intercept;
    elseif function_type==3
        Highest_Power=input('Please enter the highest power: ');
        for j= Highest_Power:-1:1
            coefficient = input(['Please enter the coefficient for the term
X^',int2str(j),': ']);
            tempPoly=[tempPoly coefficient];
        end
        intercept= input('Please enter intercept: ');
        tempPoly=[tempPoly intercept];
        y = polyval(tempPoly,t);
    elseif function_type==4
        Exponential_Amplitude=input('Please enter the amplitude: ');
        Exponent=input('Please enter the exponent: ');
        y=Exponential_Amplitude * exp(Exponent*t);

    elseif function_type==5
        Sinusoidal_Amplitude=input('Please enter signal amplitude: ');
        Sinusoidal_Frequency =input('Please enter signal frequency: ');
        Sinusoidal_PhaseShift=input('Please enter the phase shift: ');

```

```

        y = Sinusoidal_Amplitude * sin(Sinusoidal_Frequency * t +
Sinusoidal_PhaseShift);
    end
    t_tot=[t_tot t];
    y_tot=[y_tot y];
end
figure;plot(t_tot,y_tot);
title('SIGNALS GENERATED');
operation = input('\n\nPlease enter the type of the operation to be
performed on signal\n1.Amplitude Scaling\n2.Time Reversal\n3.Time
Shift\n4.Signal Expansion\n5.Signal Compression\n6.None\n\nOperation: ');
switch operation
    case 1
        factor = input('Please enter the amplitude scale: ');
        y_tot = factor .* y_tot;
    case 2
        t_tot = -1 .* t_tot;
    case 3
        factor = input('Please enter the shifting value: ');
        t_tot = factor + t_tot;
    case 4
        factor = input('Please enter the expansion factor: ');
        t_tot = t_tot .* factor;
    case 5
        factor = input('Please enter the compression factor: ');
        t_tot = t_tot ./ factor;
    case 6
        disp('No operation was done on signal!');
    otherwise
        disp('Operation not in choices!\n')
end
figure;plot(t_tot,y_tot);
title('SIGNALS AFTER OPERATION');

```

Sample Runs:

I. 0 break points
With no operation done on
signal

Command Window

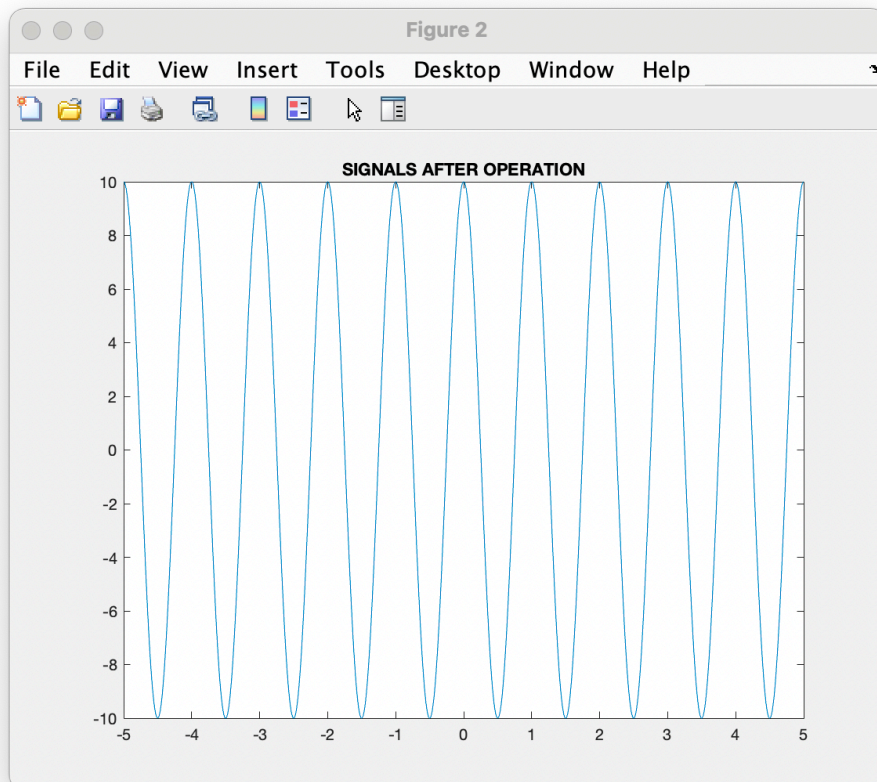
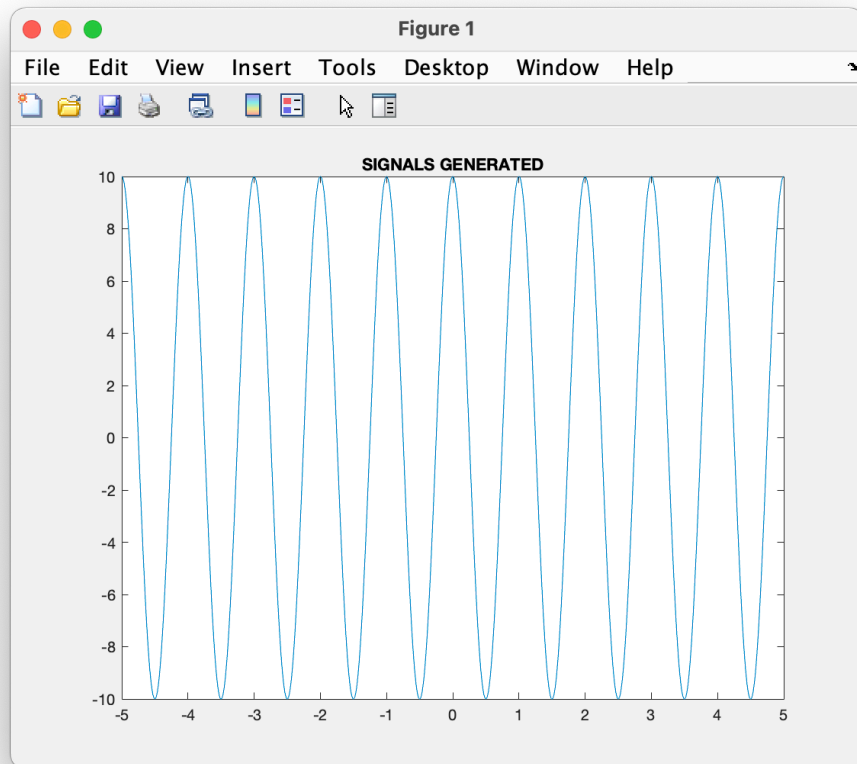
```
Please enter the sampling frequency required: 1000
Please enter signal starting time: -5
Please enter signal end time: 5
please enter number of break points: 0
```

```
Please enter the type of the function in position [-5 : 5]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal
```

```
Function type: 5
Please enter signal amplitude: 10
Please enter signal frequency: 2*pi
Please enter the phase shift: pi/2
```

```
Please enter the type of the operation to be performed on signal
1.Amplitude Scaling
2.Time Reversal
3.Time Shift
4.Signal Expansion
5.Signal Compression
6.None
```

```
Operation: 6
No operation was done on signal!
>>
```



II. 1 break point

With time reversal operation
done on signal

Command Window

Please enter the sampling frequency required: 1000
Please enter signal starting time: -2
Please enter signal end time: 7
please enter number of break points: 1
Please enter break point #1 position: 3.5

Please enter the type of the function in position [-2 : 3.5]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal

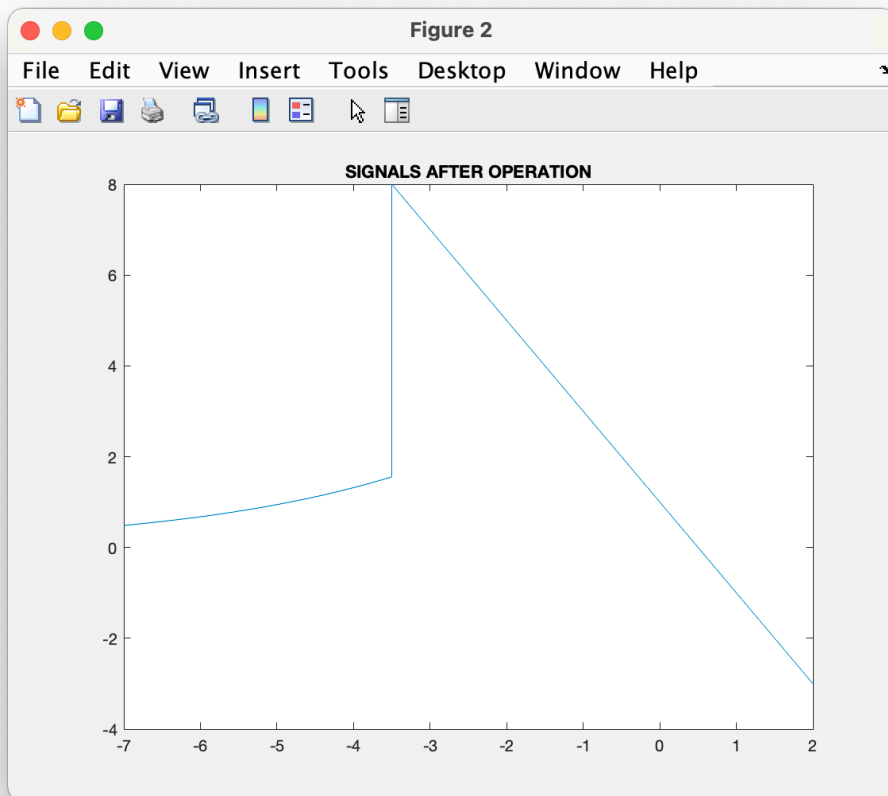
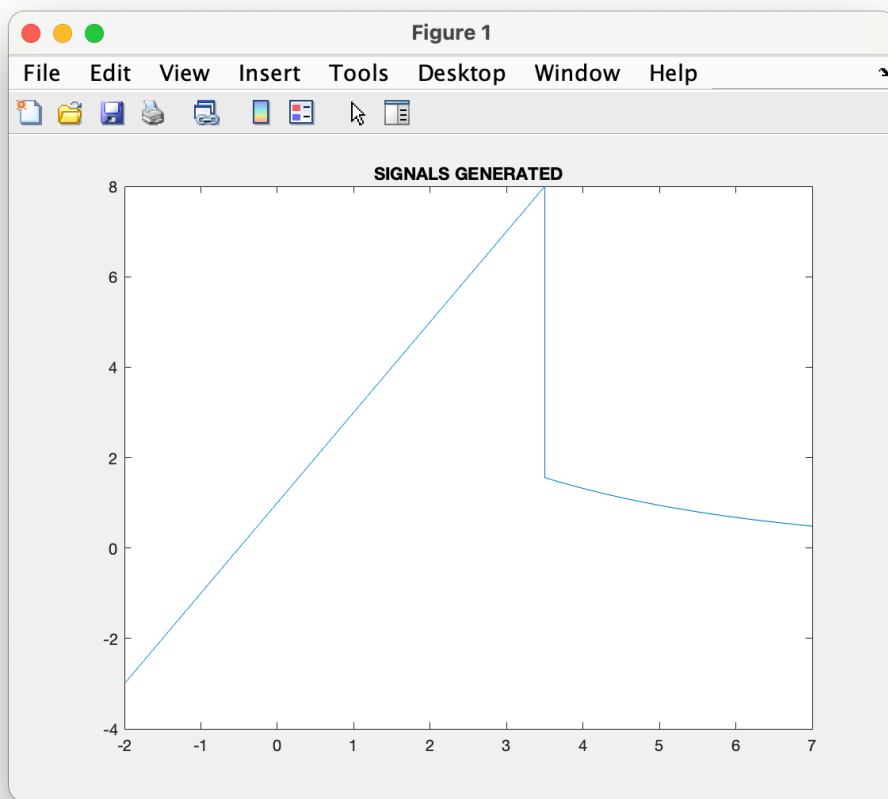
Function type: 2
Please enter the slope: 2
Please enter the intercept: 1

Please enter the type of the function in position [3.5 : 7]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal

Function type: 4
Please enter the amplitude: 5
Please enter the exponent: -1/3

Please enter the type of the operation to be performed on signal
1.Amplitude Scaling
2.Time Reversal
3.Time Shift
4.Signal Expansion
5.Signal Compression
6.None

Operation: 2
>>



III. 2 break points

With time compression
operation done on signal

Command Window

Please enter the sampling frequency required: 1000

Please enter signal starting time: -10

Please enter signal end time: 10

please enter number of break points: 2

Please enter break point #1 position: -3

Please enter break point #2 position: 2

Please enter the type of the function in position [-10 : -3]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 1

Please enter signal amplitude: 10

Please enter the type of the function in position [-3 : 2]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 3

Please enter the highest power: 3

Please enter the coefficient for the term X^3 :2

Please enter the coefficient for the term X^2 :3

Please enter the coefficient for the term X^1 :1

Please enter intercept: 0

Please enter the type of the function in position [2 : 10]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 5

Please enter signal amplitude: 28

Please enter signal frequency: 2π

Please enter the phase shift: $\pi/2$

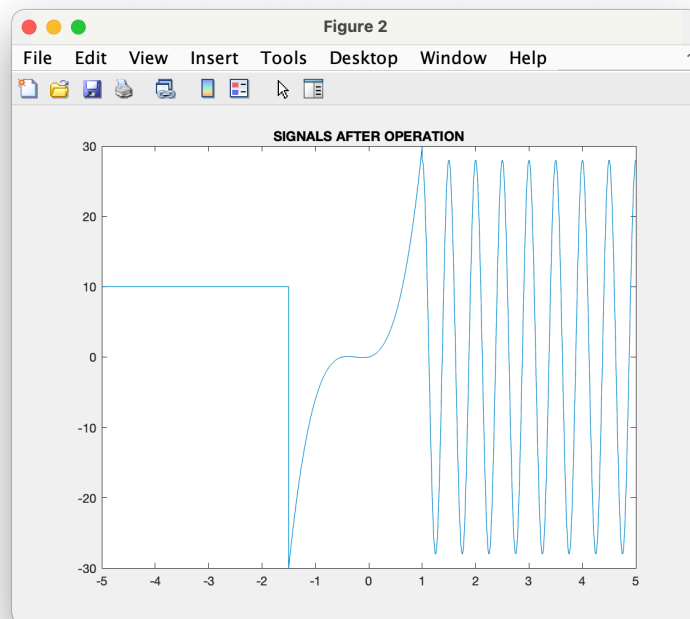
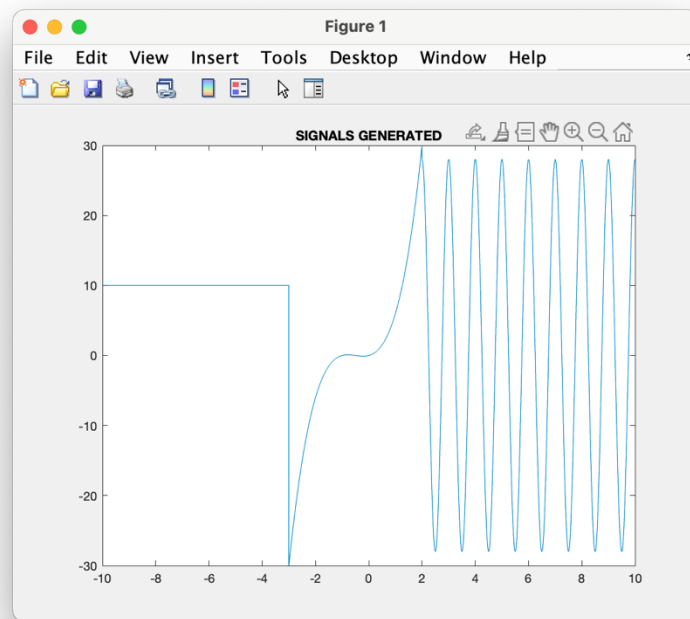
Please enter the type of the operation to be performed on signal

1. Amplitude Scaling
2. Time Reversal
3. Time Shift
4. Signal Expansion
5. Signal Compression
6. None

Operation: 5

Please enter the compression factor: 2

>>



IV. 3 break points

With time reversal operation
done on signal

Command Window

```
Please enter the sampling frequency required: 1000
Please enter signal starting time: 0
Please enter signal end time: 20
please enter number of break points: 3
Please enter break point #1 position: 6
Please enter break point #2 position: 9
Please enter break point #3 position: 17
```

```
Please enter the type of the function in position [0 : 6]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal
```

```
Function type: 1
Please enter signal amplitude: 7
```

```
Please enter the type of the function in position [6 : 9]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal
```

```
Function type: 5
Please enter signal amplitude: 3
Please enter signal frequency: pi
Please enter the phase shift: 0
```

```
Please enter the type of the function in position [9 : 17]
1.DC Signal
2.Ramp Signal
3.General Order Polynomial
4.Exponential Signal
5.Sinusoidal Signal
```

```
Function type: 2
Please enter the slope: -2
Please enter the intercept: 18
```

Please enter the type of the function in position [17 : 20]

- 1.DC Signal
- 2.Ramp Signal
- 3.General Order Polynomial
- 4.Exponential Signal
- 5.Sinusoidal Signal

Function type: 3

Please enter the highest power: 2

Please enter the coefficient for the term X^2 :1

Please enter the coefficient for the term X^1 :0

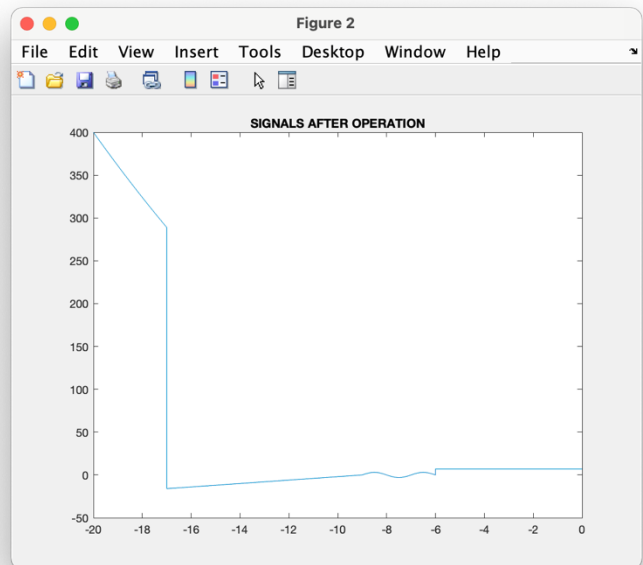
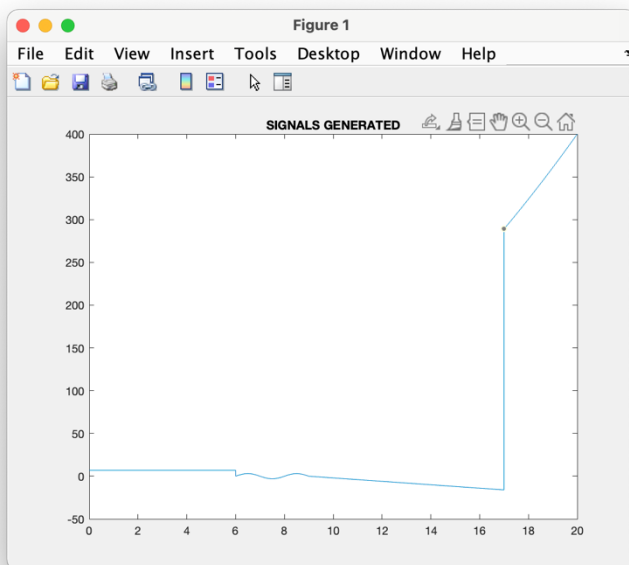
Please enter intercept: 0

Please enter the type of the operation to be performed on signal

- 1.Amplitude Scaling
- 2.Time Reversal
- 3.Time Shift
- 4.Signal Expansion
- 5.Signal Compression
- 6.None

Operation: 2

>>



V. 4 break points

With amplitude scale operation done on signal

Command Window

Please enter the sampling frequency required: 1000

Please enter signal starting time: -15

Please enter signal end time: 15

please enter number of break points: 4

Please enter break point #1 position: -8

Please enter break point #2 position: 0

Please enter break point #3 position: 4

Please enter break point #4 position: 10

Please enter the type of the function in position [-15 : -8]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 1

Please enter signal amplitude: 2

Please enter the type of the function in position [-8 : 0]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 4

Please enter the amplitude: 7

Please enter the exponent: 2

Please enter the type of the function in position [0 : 4]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 1

Please enter signal amplitude: 7

Please enter the type of the function in position [4 : 10]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 2
Please enter the slope: -1
Please enter the intercept: 11

Please enter the type of the function in position [10 : 15]

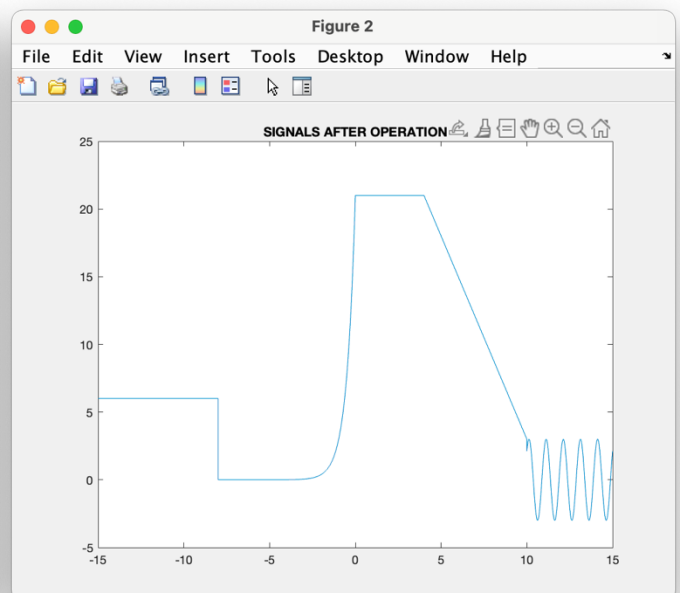
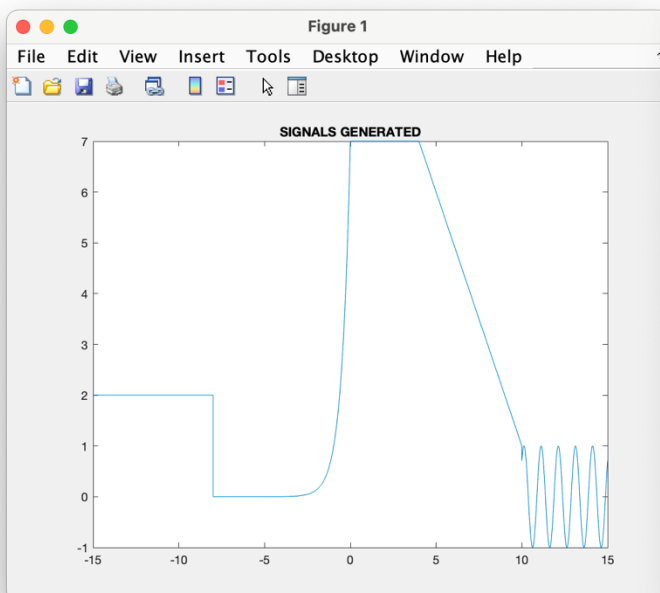
- 1.DC Signal
- 2.Ramp Signal
- 3.General Order Polynomial
- 4.Exponential Signal
- 5.Sinusoidal Signal

Function type: 5
Please enter signal amplitude: 1
Please enter signal frequency: 2π
Please enter the phase shift: $\pi/4$

Please enter the type of the operation to be performed on signal

- 1.Amplitude Scaling
- 2.Time Reversal
- 3.Time Shift
- 4.Signal Expansion
- 5.Signal Compression
- 6.None

Operation: 1
Please enter the amplitude scale: 3
>>



VI. 5 break points

With time expansion operation
done on signal

Command Window

Please enter the sampling frequency required: 1000

Please enter signal starting time: -10

Please enter signal end time: 10

please enter number of break points: 5

Please enter break point #1 position: -7

Please enter break point #2 position: -3

Please enter break point #3 position: 0

Please enter break point #4 position: 2

Please enter break point #5 position: 6

Please enter the type of the function in position [-10 : -7]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 2

Please enter the slope: 2

Please enter the intercept: 15

Please enter the type of the function in position [-7 : -3]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 5

Please enter signal amplitude: 4

Please enter signal frequency: 2π

Please enter the phase shift: 0

Please enter the type of the function in position [-3 : 0]

1.DC Signal

2.Ramp Signal

3.General Order Polynomial

4.Exponential Signal

5.Sinusoidal Signal

Function type: 1

Please enter signal amplitude: 7

Please enter the type of the function in position [0 : 2]

- 1.DC Signal
- 2.Ramp Signal
- 3.General Order Polynomial
- 4.Exponential Signal
- 5.Sinusoidal Signal

Function type: 3

Please enter the highest power: 3

Please enter the coefficient for the term X^3 :1

Please enter the coefficient for the term X^2 :7

Please enter the coefficient for the term X^1 :2

Please enter intercept: 0

Please enter the type of the function in position [2 : 6]

- 1.DC Signal
- 2.Ramp Signal
- 3.General Order Polynomial
- 4.Exponential Signal
- 5.Sinusoidal Signal

Function type: 4

Please enter the amplitude: 5

Please enter the exponent: 1/5

Please enter the type of the function in position [6 : 10]

- 1.DC Signal
- 2.Ramp Signal
- 3.General Order Polynomial
- 4.Exponential Signal
- 5.Sinusoidal Signal

Function type: 1

Please enter signal amplitude: 10

Please enter the type of the operation to be performed on signal

- 1.Amplitude Scaling
- 2.Time Reversal
- 3.Time Shift
- 4.Signal Expansion
- 5.Signal Compression
- 6.None

Operation: 4

Please enter the expansion factor: 3

>>

