Signal Generator Report

Code

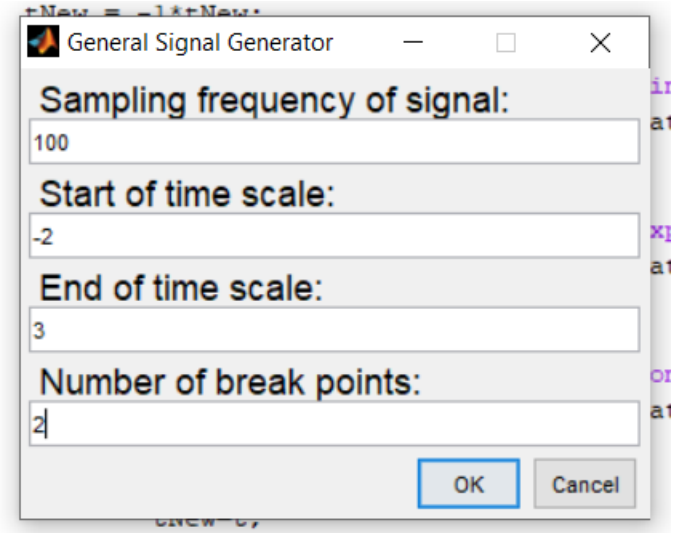
```
clc;clear;close all
flag=0;
while flag==0
    prompt = {'\fontsize{13} Sampling frequency of signal:','\fontsize{13}
Start of time scale:', '\fontsize{13} End of time scale:', '\fontsize{13}
Number of break points:'}; %Subtitles
    dlgtitle = 'General Signal Generator'; %Title
    size = [1 50]; %Size to show whole title
    definput = {'100','0','0','0'}; %Default values
    opts.Interpreter = 'tex'; %Enable tex markup to increase font
    answer = inputdlg(prompt,dlgtitle,size,definput,opts);
    samplingFrequency =  str2double(answer{1}); %convert string entered to
double
    startTime =  str2double(answer{2});
    endTime =  str2double(answer{3});
    numberOfBreaks =  str2double(answer{4});
    positionMatrix = zeros(1,numberOfBreaks);
    if samplingFrequency<=0 || startTime>=endTime
       fprintf('Error in Input\n')
    else flag=1;
    end
end



for i=1:numberOfBreaks
    positionPrompt = { ['\fontsize{13}Position' num2str(i) '\fontsize{13}
:']};
    dlgtitlePostion = 'Position Selector'; %Title
    definputPosition = {'0'}; %Default values
    postions =
inputdlg(positionPrompt,dlgtitlePostion,size,definputPosition,opts);
    positionMatrix(1,i) = str2double(postions{1});
end
positionMatrix(1,numberOfBreaks+1)=endTime;

choiceMatrix=zeros(1,numberOfBreaks+1);
startT=startTime;
X=[];

for i=1:numberOfBreaks+1
    str = ['Choose Signal for section ' num2str(i) ':'];
    choiceMatrix(1,i) = menu(str,'DC','Ramp','General Order
Polynomial','Exponential','Sinusoidal');
    endT=positionMatrix(1,i);
    t1=linspace(startT,endT,(endT-startT)*samplingFrequency);
    dlgtitleData = 'Data Selector'; %Title
if choiceMatrix(1,i)==1
    prompt3 = { '\fontsize{13} Amplitude: '};
    definputData = {'0'}; %Default values
    answer = inputdlg(prompt3,dlgtitleData,size,definputData,opts);
    amplitudeDC(1,i) =  str2double(answer{1});
    X1 = amplitudeDC(1,i) * ones(1,(endT-startT)*samplingFrequency);
```

```
else if choiceMatrix(1,i)==2
prompt3 = { '\fontsize{13}Slope: ', '\fontsize{13}Intercept:'};
    definputData = {'0','0'}; %Default values
    answer = inputdlg(prompt3,dlgtitleData,size,definputData,opts);
    slopeRamp(1,i) =  str2double(answer{1});
    interceptRamp(1,i) =  str2double(answer{2});
    X1=slopeRamp(1,i)*t1 + interceptRamp(1,i);
else if choiceMatrix(1,i)==3
    prompt3={'\fontsize{13}Max Power'};
    definputData = {'0'}; %Default values
    answer = inputdlg(prompt3,dlgtitleData,size,definputData,opts);
    p=[];
    for j=0:(str2num(answer{1}))
            promptAmplitude = {['\fontsize{13}Amplitude x^'
num2str(str2num(answer{1})-j) '\fontsize{13}: ']};
            amplitude =
inputdlg(promptAmplitude,dlgtitleData,size,definputData,opts);
            p=[p str2double(amplitude{1})];
    end
    X1=polyval(p, t1);

else if choiceMatrix(1,i)==4
prompt3 = { '\fontsize{13}Amplitude: ', '\fontsize{13}Exponent:'};
    definputData = {'0','0'}; %Default values
    answer = inputdlg(prompt3,dlgtitleData,size,definputData,opts);
    amplitudeExp(1,i) =  str2double(answer{1});
    exponentExp(1,i) =  str2double(answer{2});
        X1=amplitudeExp(1,i)*exp(exponentExp(1,i)*t1);
else if choiceMatrix(1,i)==5
prompt3 = { '\fontsize{13}Amplitude: ',
'\fontsize{13}Frequency:','\fontsize{13}Phase in Degree'};
    definputData = {'0','0','0'}; %Default values
    answer = inputdlg(prompt3,dlgtitleData,size,definputData,opts);
    amplitudeSin(1,i) =  str2double(answer{1});
    frequencySin(1,i) =  str2double(answer{2});
    phaseSin(1,i) =  str2double(answer{3})*pi/180;
     X1 = amplitudeSin(1,i)*cos(2*frequencySin(1,i)*pi*t1 + phaseSin(1,i));
    end
    end
    end
    end
end
X=[X X1];
startT=positionMatrix(1,i);
end

t = linspace(startTime,endTime,(endTime-startTime)*samplingFrequency);
plot(t,X)
grid on
choice = menu('Do You Want To Perform Any Operation','YES', 'NO');
if choice==1
    XNew=X;
    tNew=t;
    flag=1;
    dlgtitleData = 'Operation Selector'; %Title
    definputData = {'0'}; %Default values
```

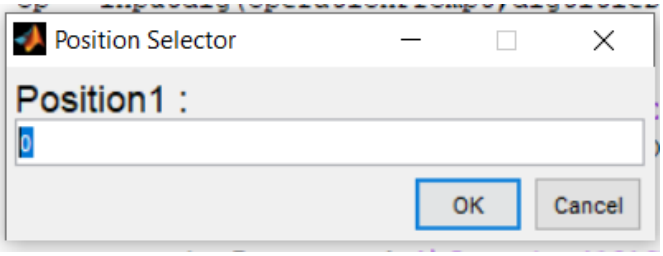
```
    while flag==1
        operation = menu('Choose Operation','Amplitude Scaling', 'Time
Reversal', 'Time Shift', 'Expand', 'Compress','Original Signal','None');
        if operation==1
            operationPrompt = { '\fontsize{13}Amplitude Scale By: '};
        op = inputdlg(operationPrompt,dlgtitleData,size,definputData,opts);
        XNew = str2double(op{1}) * XNew;
        else if operation==2
        tNew = -1*tNew;
        else if operation==3
            operationPrompt = { '\fontsize{13}Time Shift By: '};
        op = inputdlg(operationPrompt,dlgtitleData,size,definputData,opts);
        tNew = tNew + str2double(op{1});
        else if operation==4
            operationPrompt = { '\fontsize{13}Expand By: '};
        op = inputdlg(operationPrompt,dlgtitleData,size,definputData,opts);
        tNew = tNew * str2double(op{1});
        else if operation==5
            operationPrompt = { '\fontsize{13}Compress Signal By: '};
        op = inputdlg(operationPrompt,dlgtitleData,size,definputData,opts);
        tNew = tNew * (1/str2double(op{1}));
        else if operation==6
                tNew=t;
                XNew=X;
        else if operation ==7
                flag=0;
            end
            end
            end
            end
            end
            end
        end
    plot(tNew,XNew)
    grid on;
    end
end
```

Input

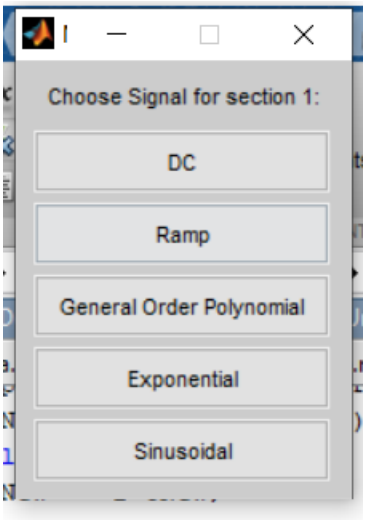
Choose Frequency, Start, End, Number of Break Points:



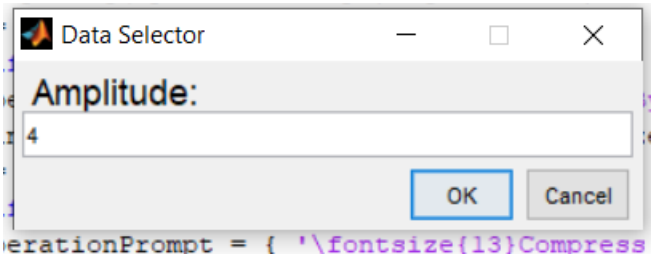
Choose Position of Break Points:



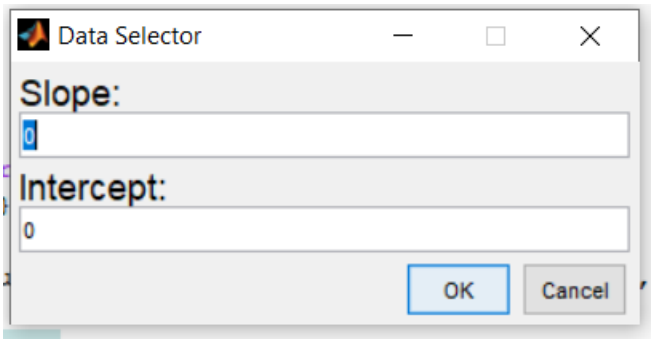
Choose Type of Signal:



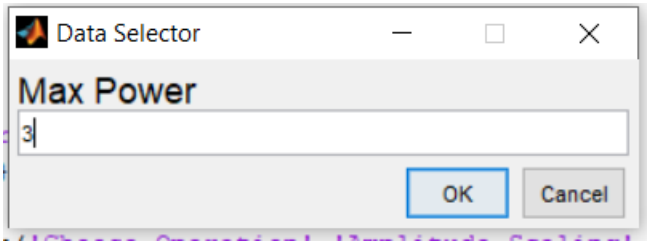
For DC:

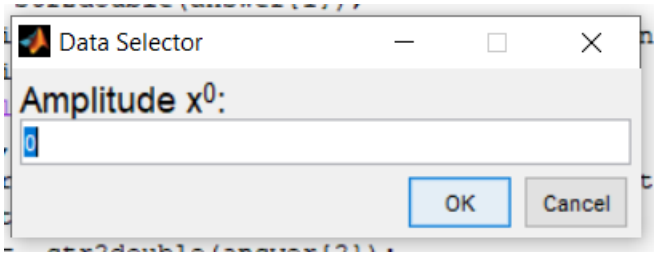


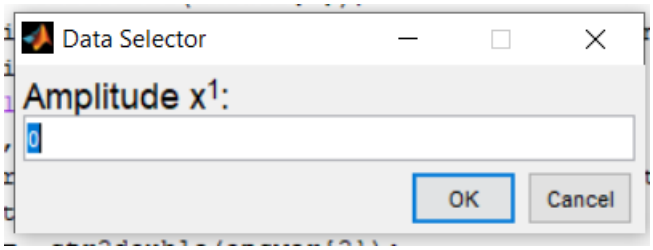
For Ramp:

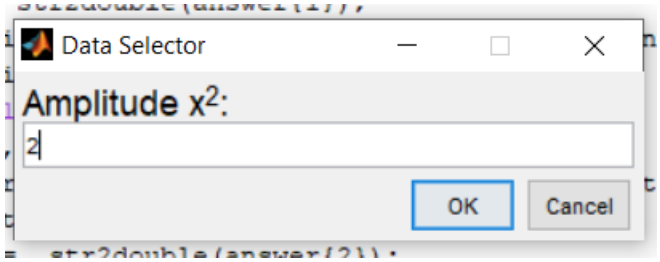


For General Order Polynomial:

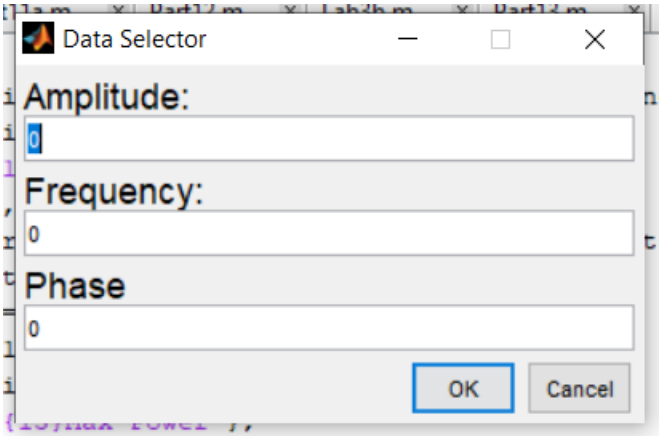






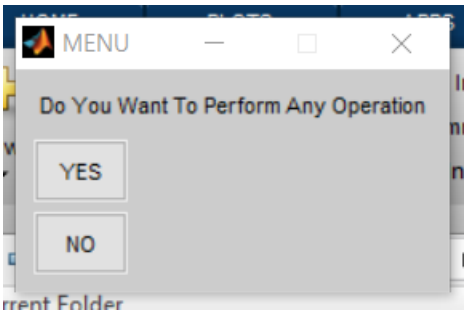


For Sinusoidal:

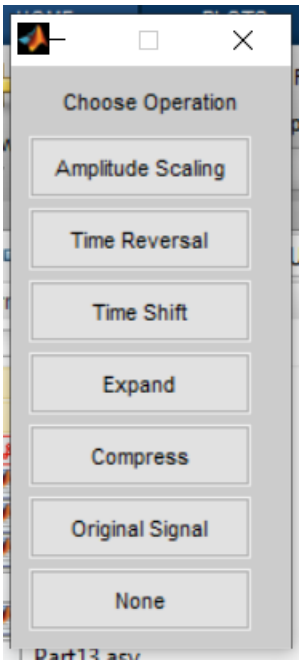


Operations

Ask user to perform any operation:



Choose Operation to be performed:



Test Cases

Test 1

Start: 0

End: 8

Number of Break Points: 4

0 → 2 : DC Signal

Amp: 0

2 → 3 : Ramp

Slope: 2

Intercept: -4

3 → 5 : DC Signal

Amp: 2

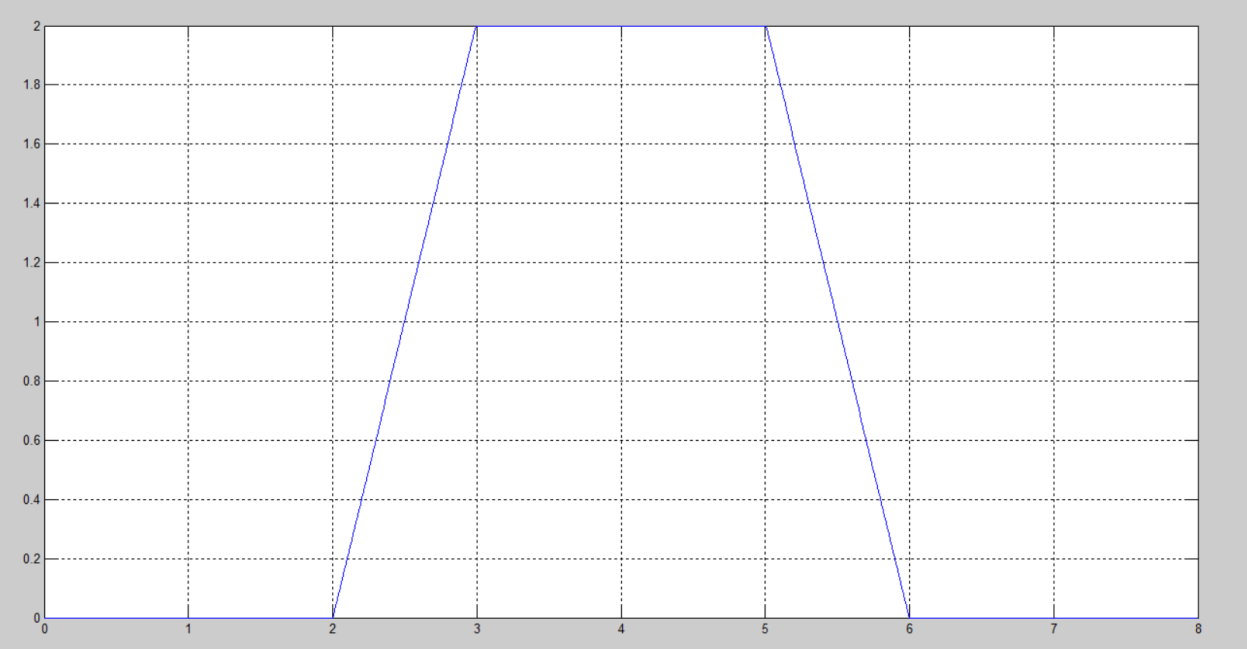
5 → 6 : Ramp

Slope: -2

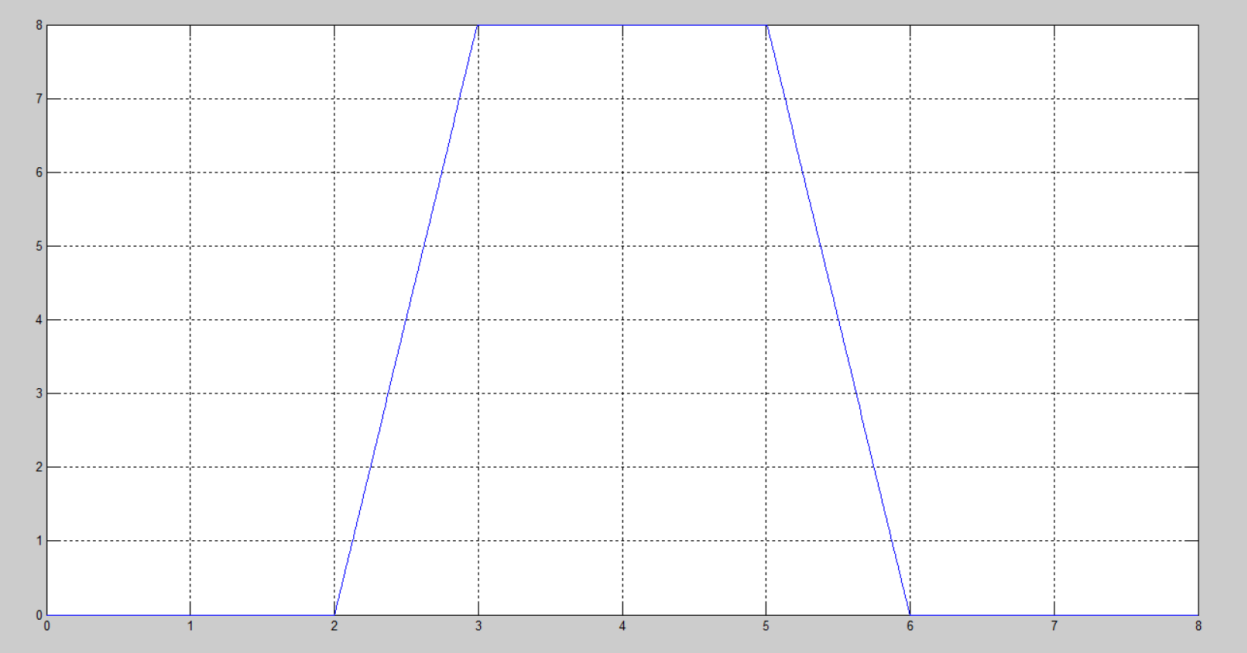
Intercept: 12

6 → 8 : DC

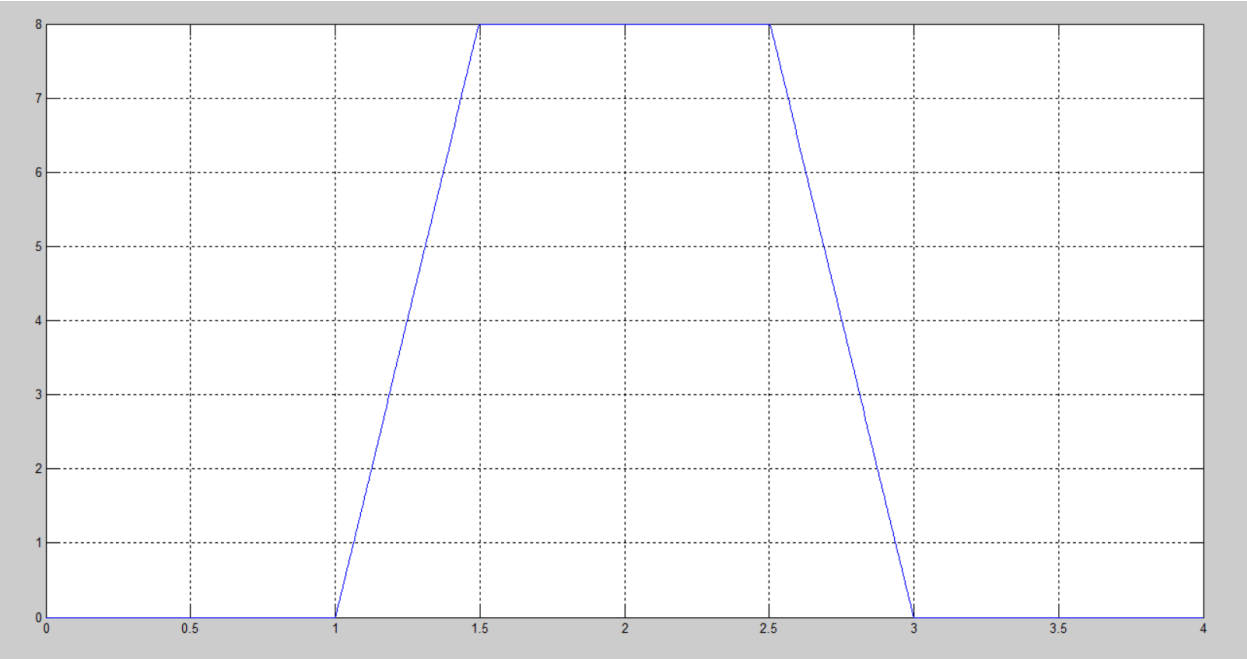
Amp: 0



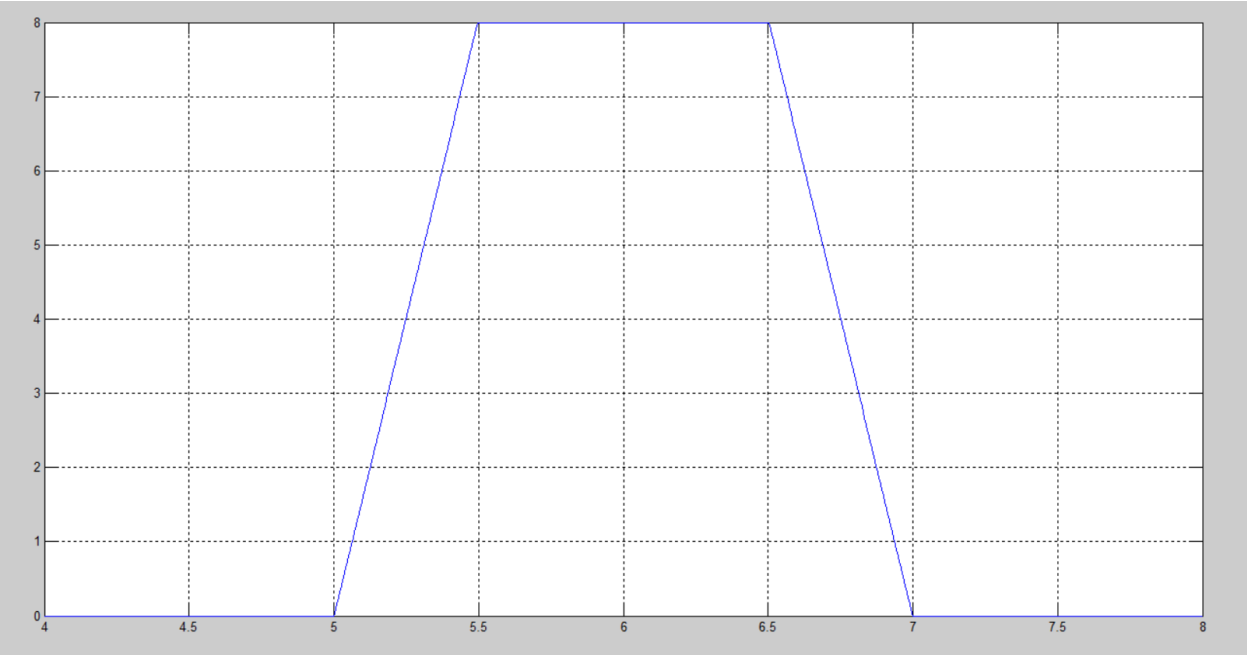
Amplitude Scaling by 4



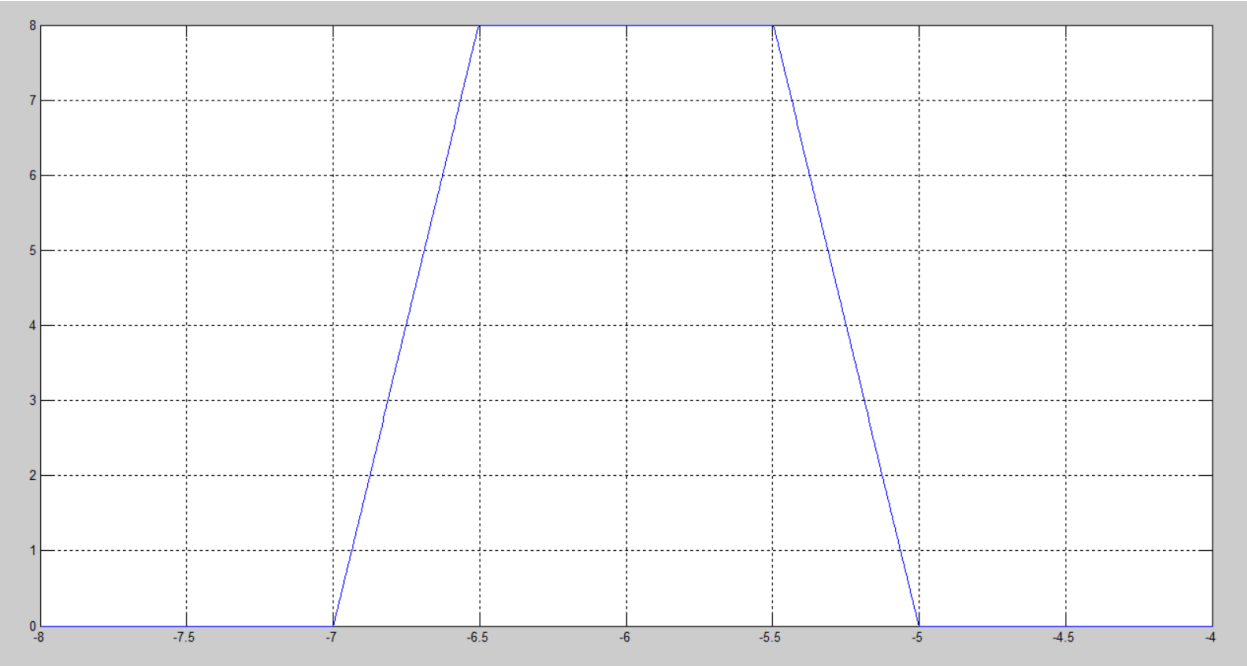
Compress by 2



Time Shift by 4



Time Reversal



Test 2

Start: -4

End: 6

Number of Break Points: 3

-4 → 0 : Exp

Amp: 4

Exponent: 1

0 → 4 : Sinusoidal

Amp: 4

Frequency: 0.25

Phase: 0

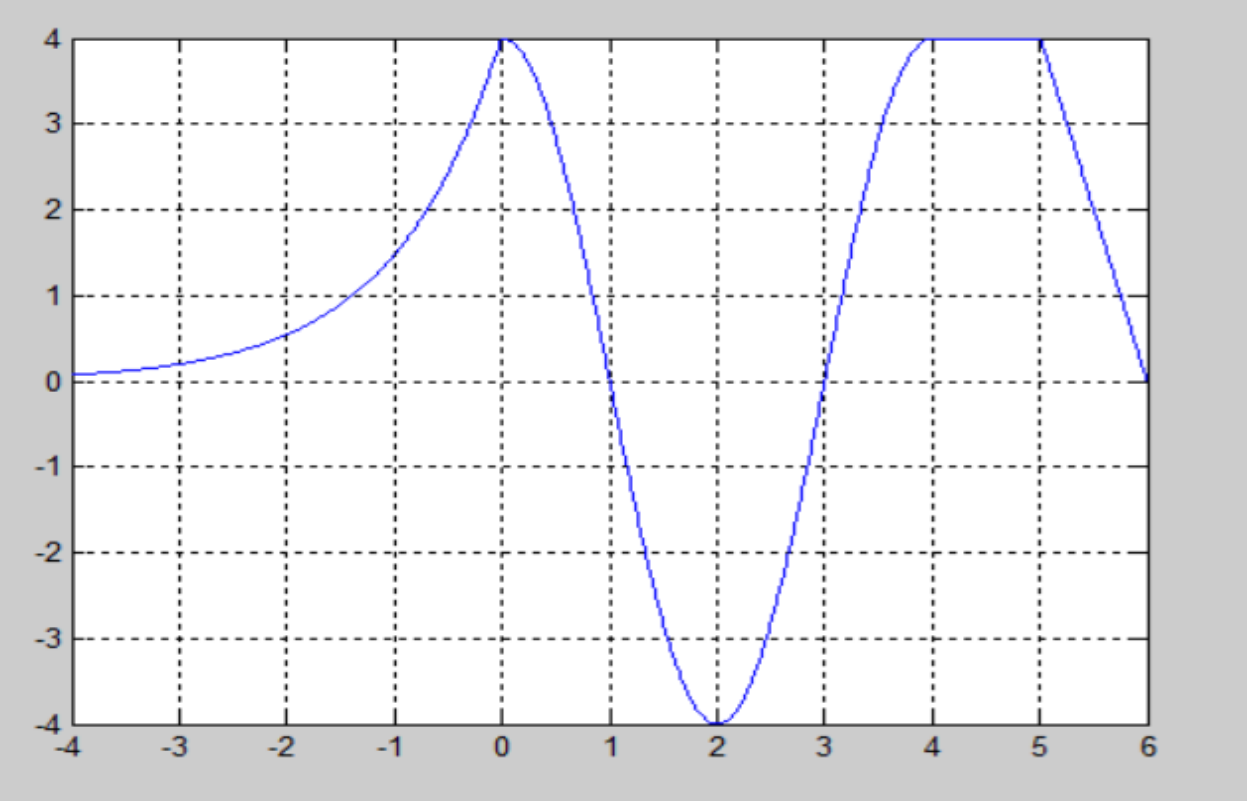
4 → 5 : DC

Amp: 4

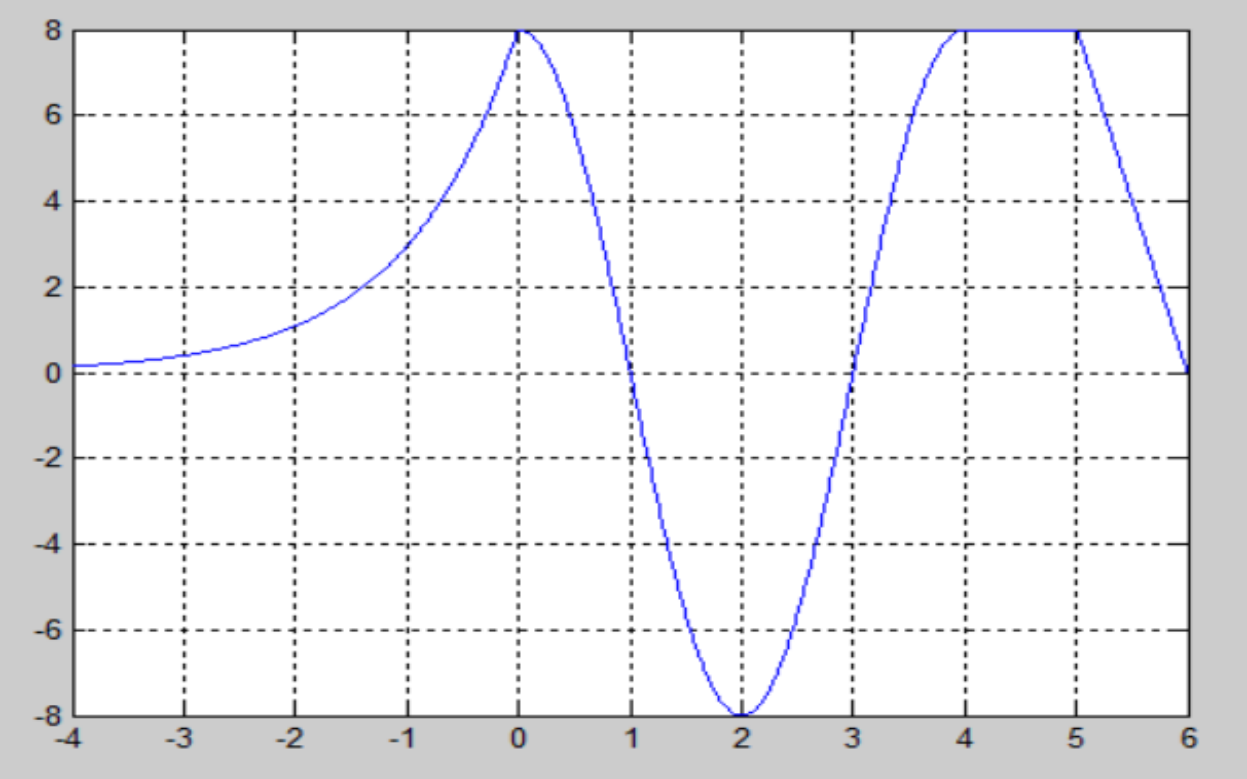
5 → 6 Ramp

Slope: -4

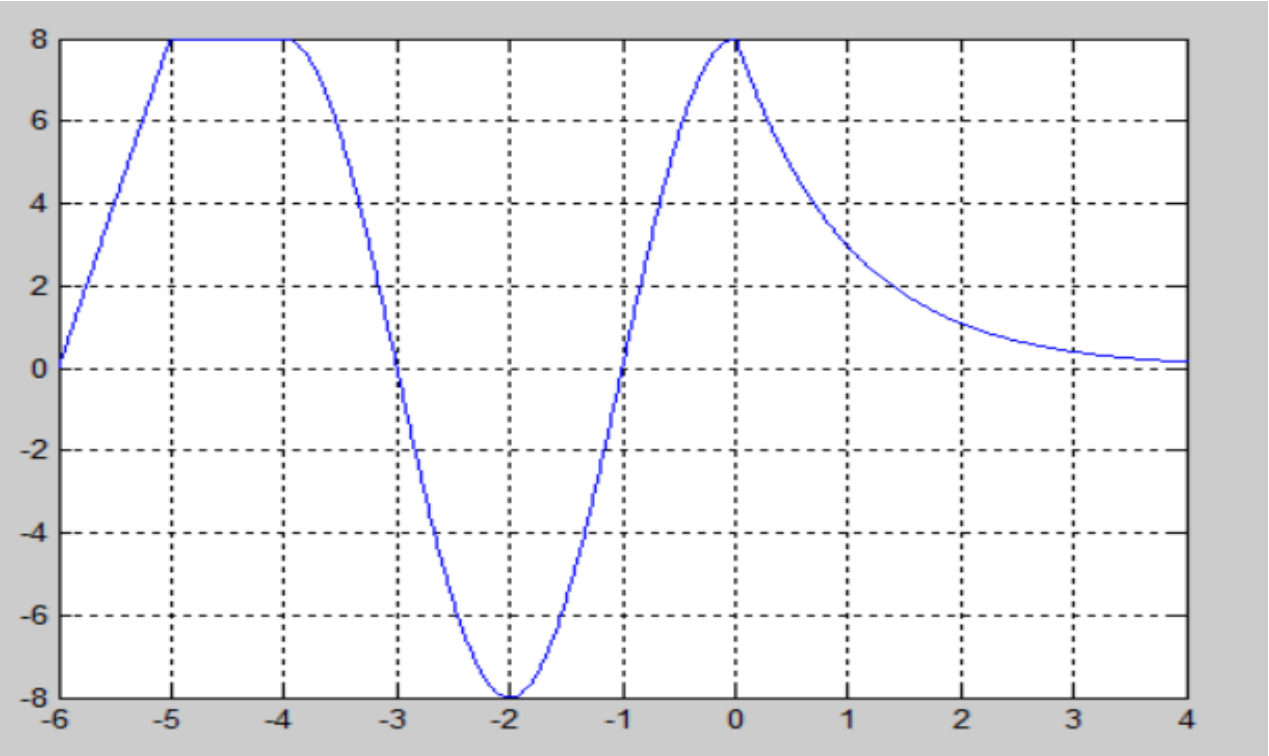
Intercept: 24



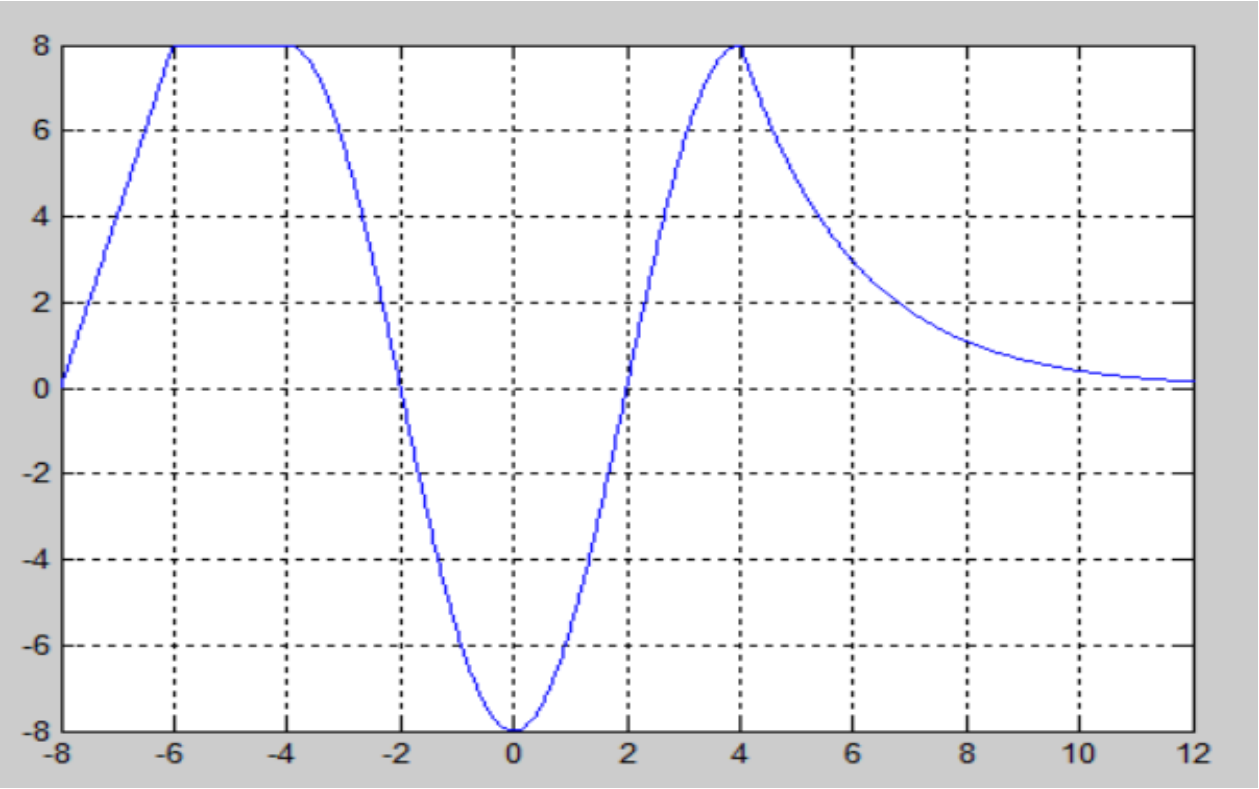
Amplitude Scaling by 2



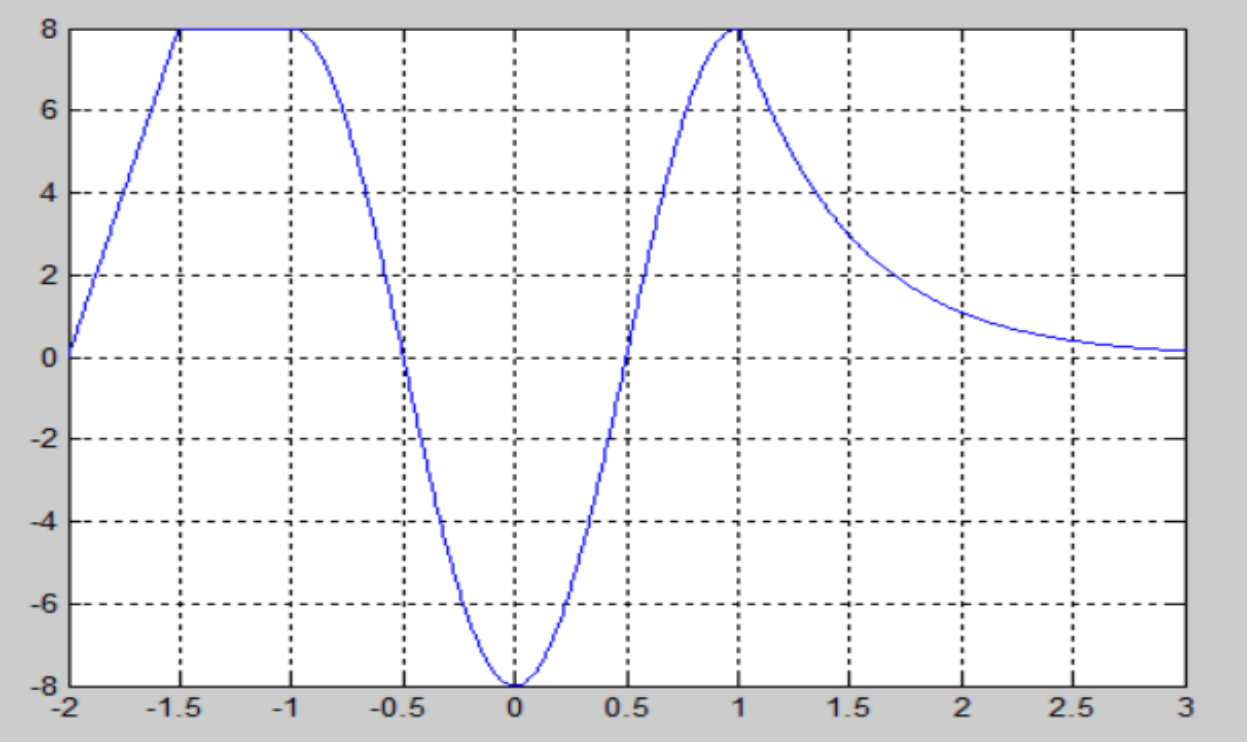
Time Reversal



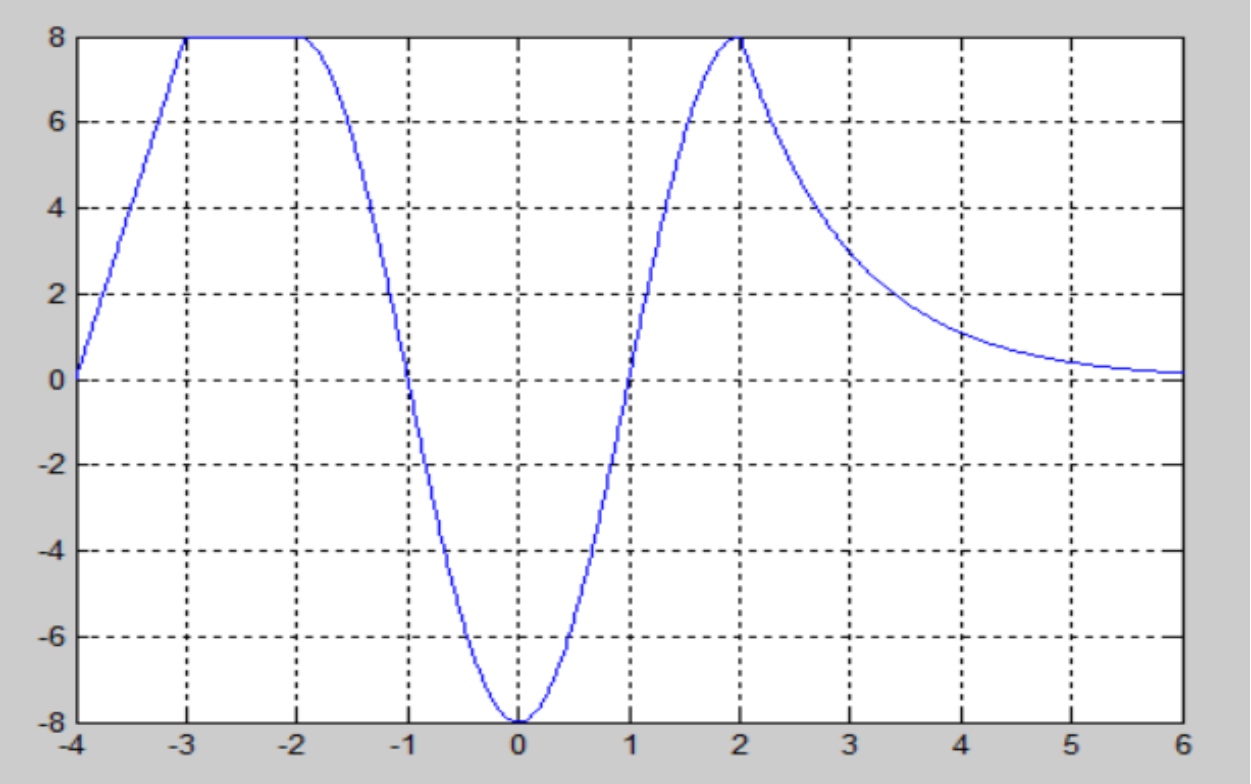
Expand by 2



Compress by 4



Shift by 2



Test 3

Start: -2

End: 2

Number of Break Points: 1

-2 → 0 : Ramp

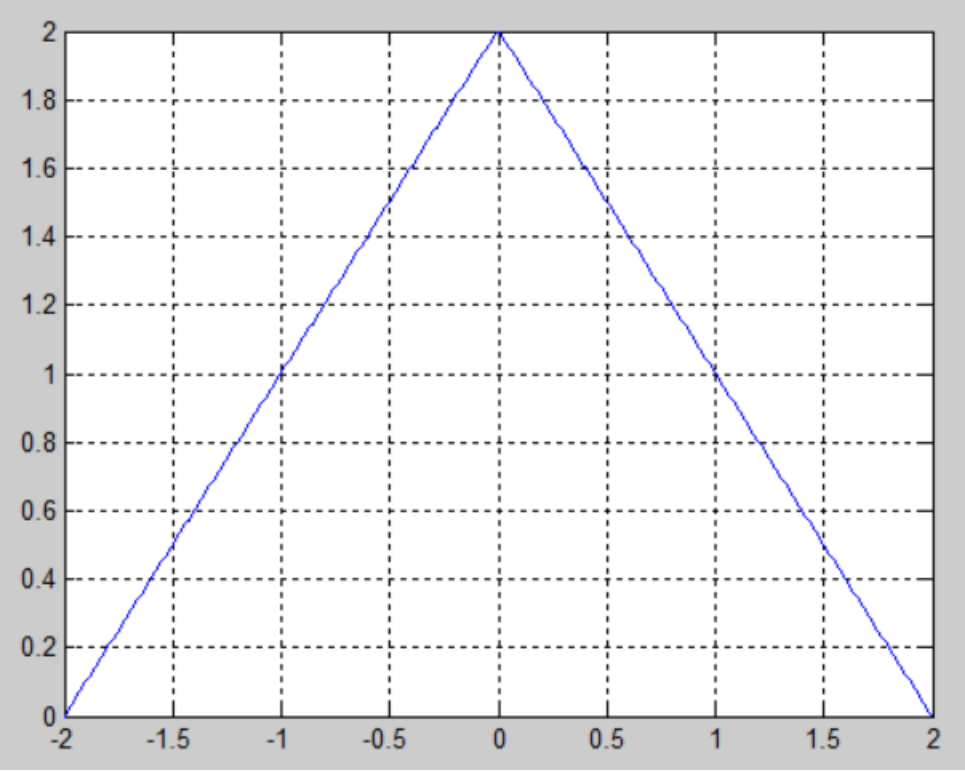
Slope: 1

Intercept: 2

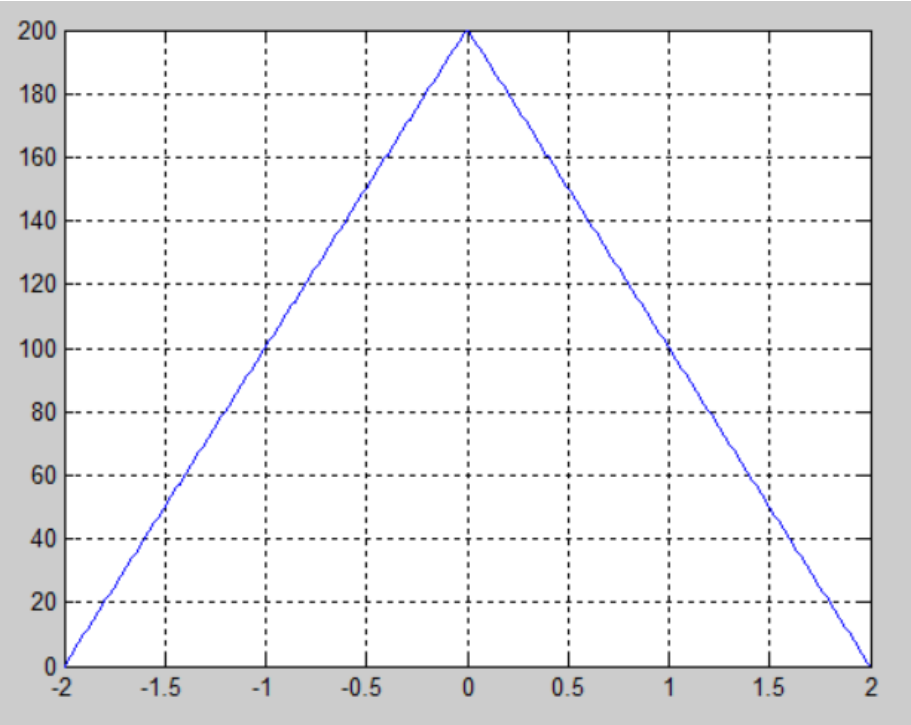
0 → 2 : Ramp

Slope: -1

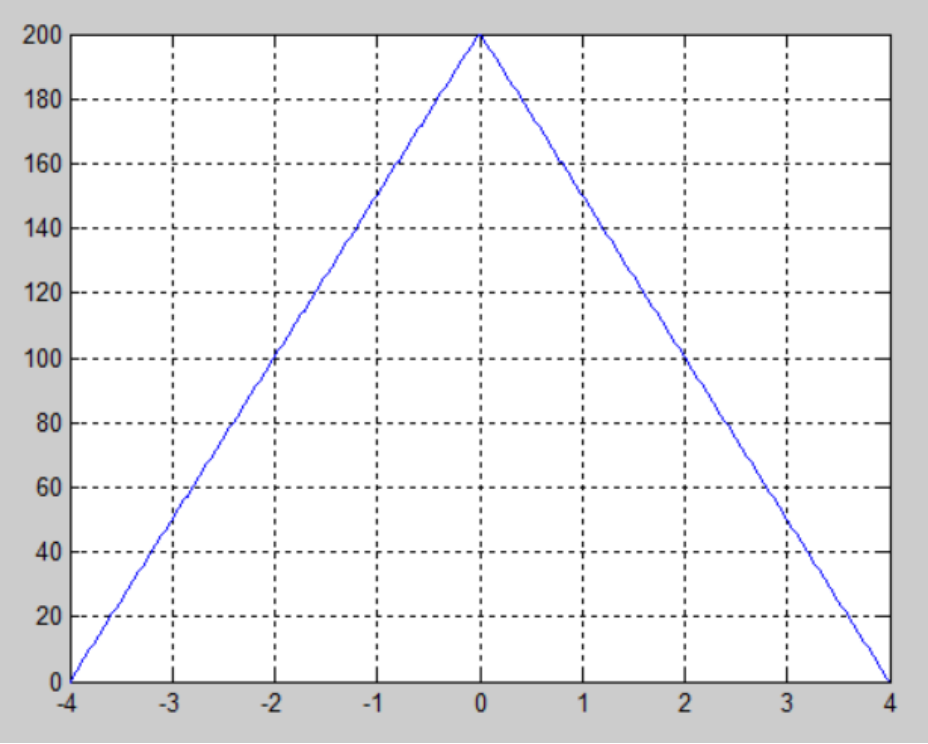
Intercept: 2



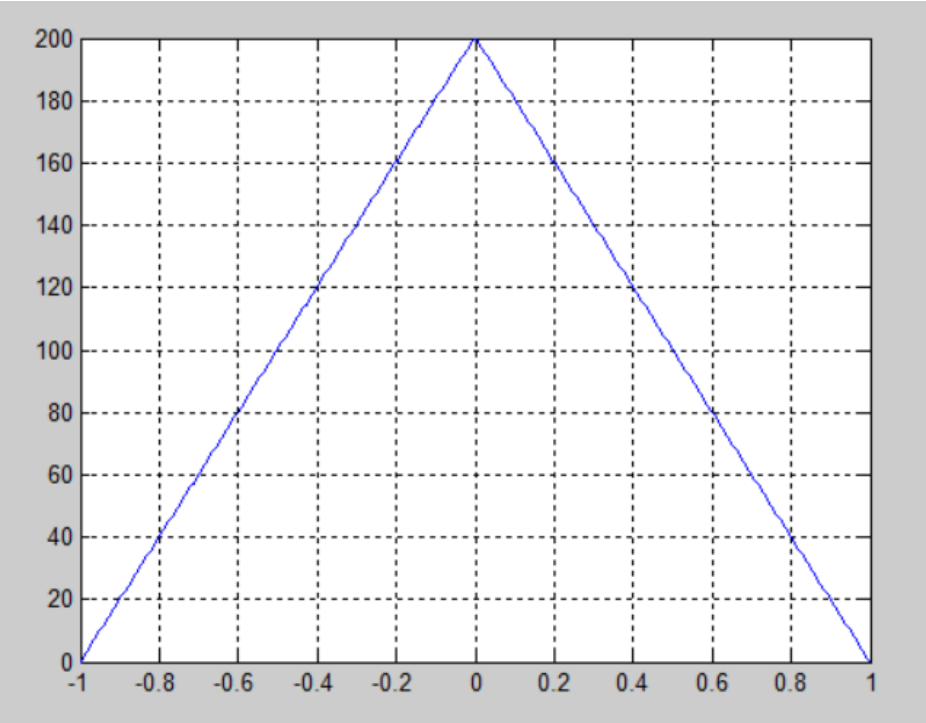
Amplitude Scaling by 100



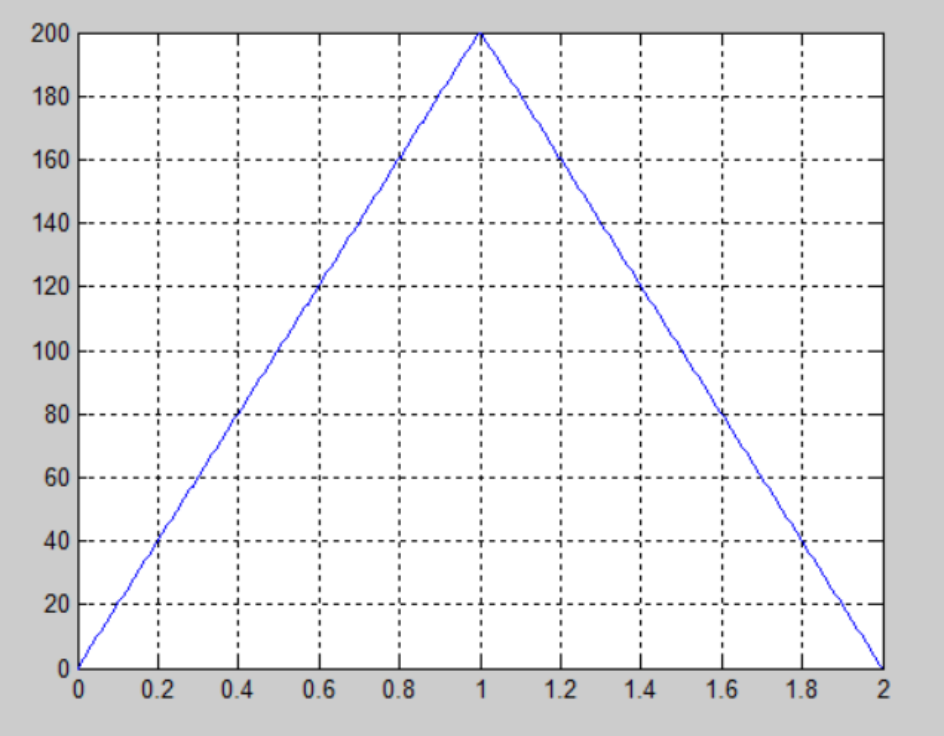
Expand by 2



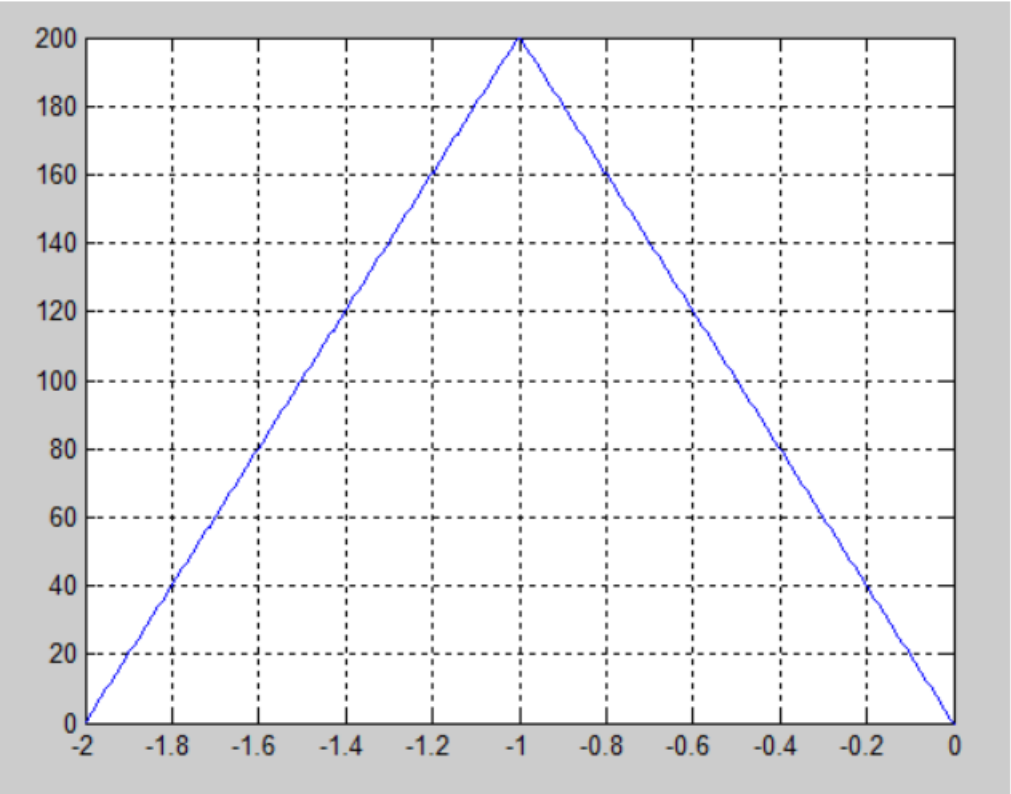
Compress by 4



Time Shift by 1



Time Reversal



Test 4

Start: -8

End: 2

Number of Break Points: 4

-8 → -6 : Ramp

Slope: -1

Intercept: -8

-6 → -4 : Ramp

Slope: 4

Intercept: 22

-4 → -2 : DC

Amp: 6

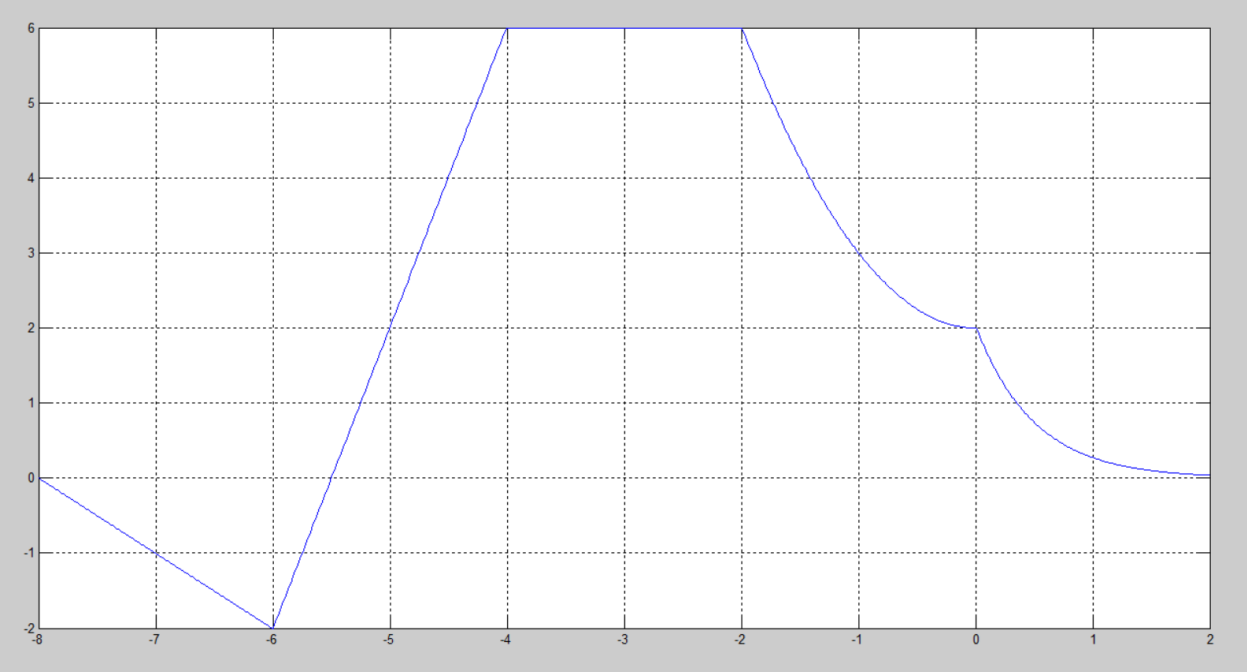
-2 → 0 : General Order Polynomial

Max Power: 2

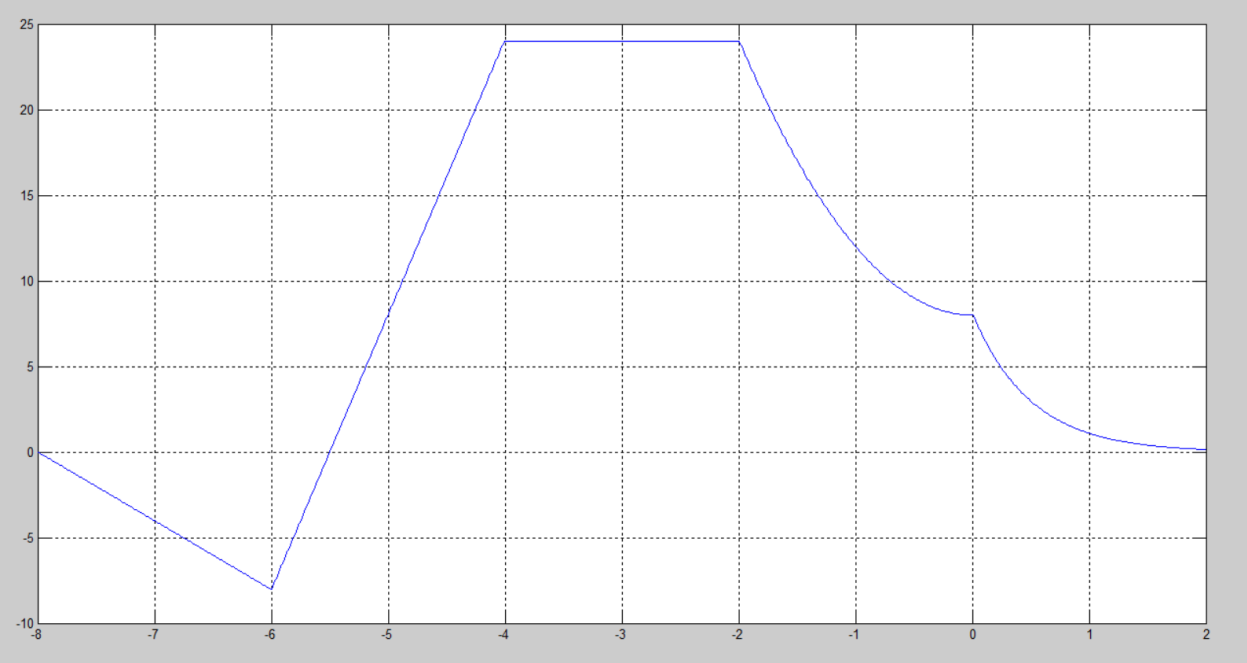
X squared coefficient: 1

Intercept: 2

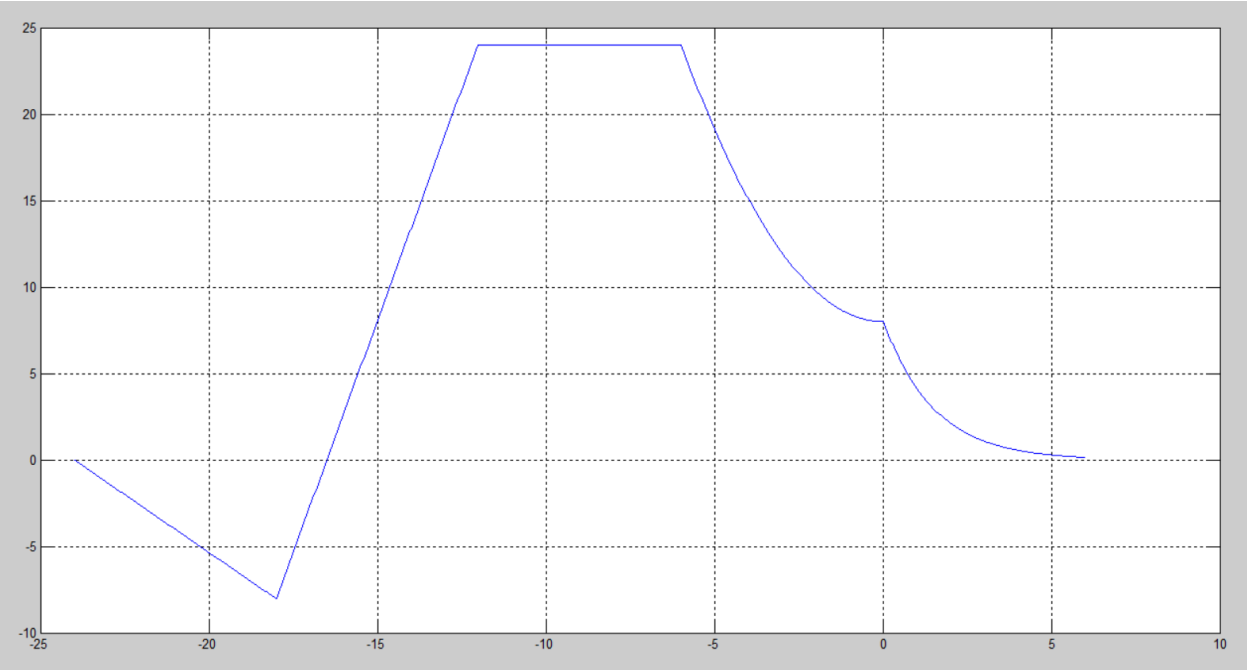
$x^2 + 2$



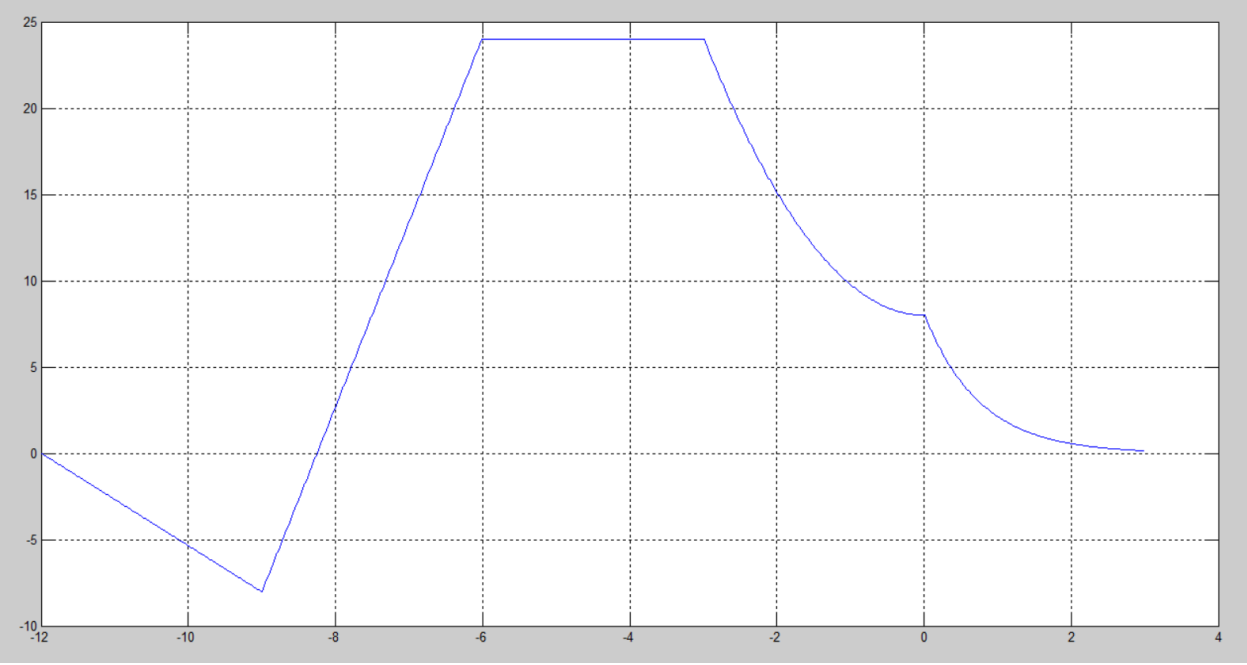
Amplitude scaling by 4



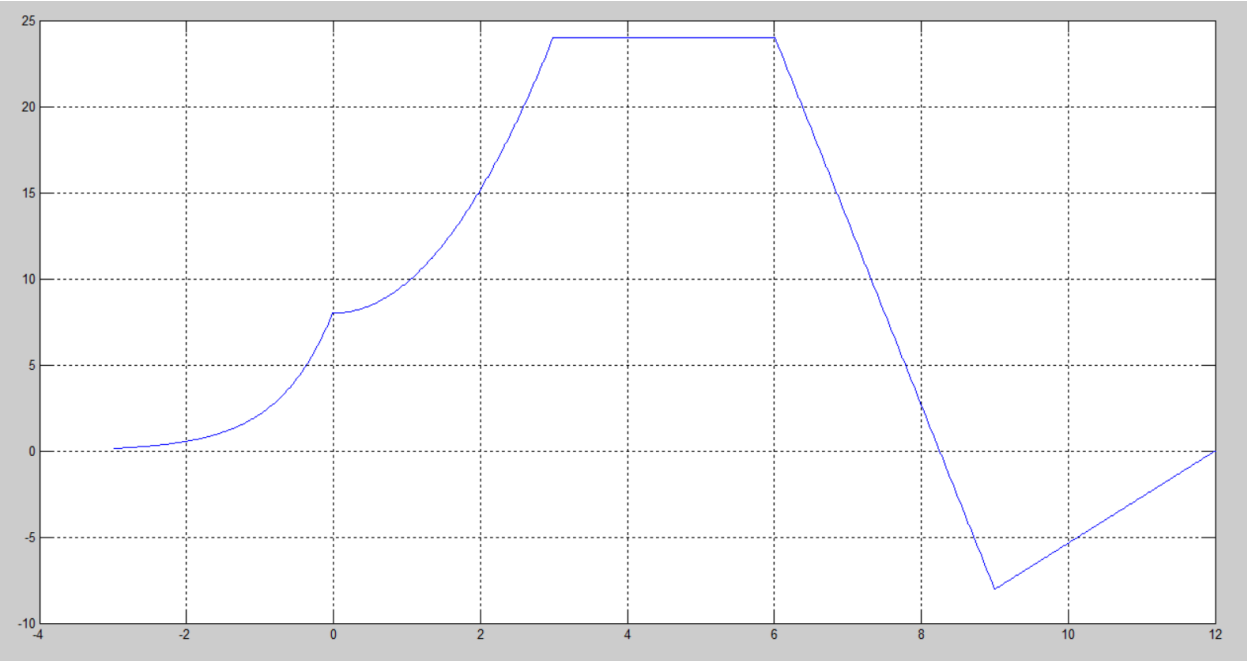
Expand by 3



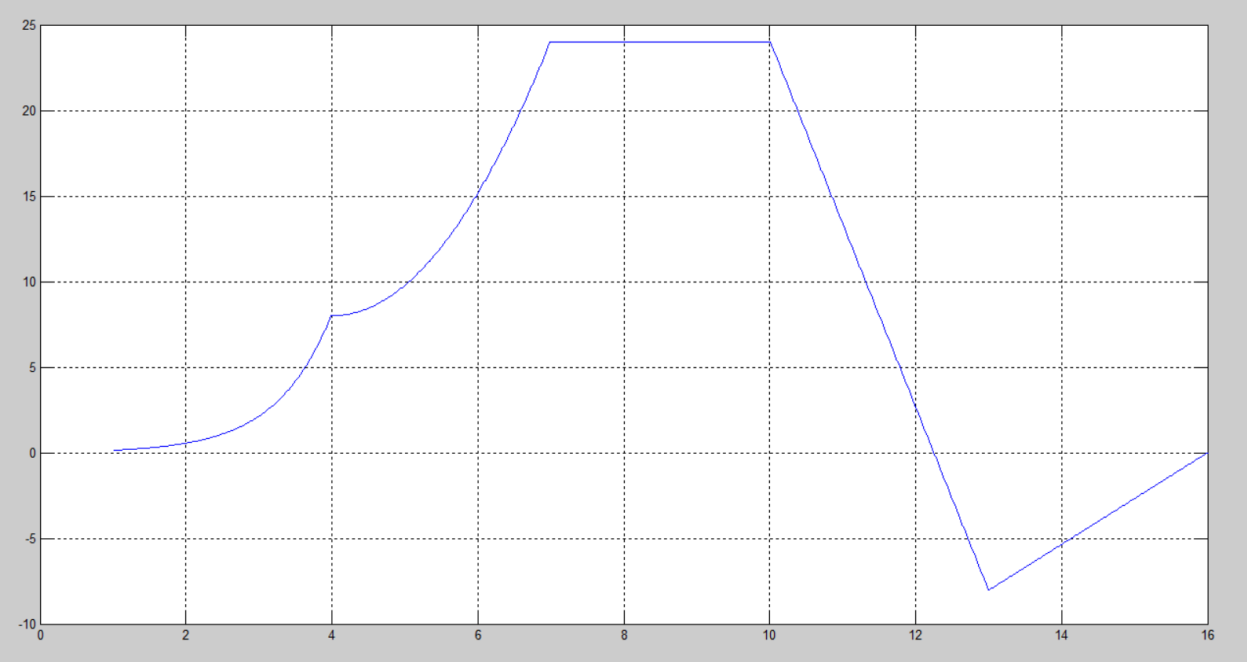
Compress by 2



Time Reversal



Time Shift by 4



Test 5

Start: -4

End: 6

Number of Break Points: 3

-4 → 0 : Exponential

Amp: 2

Exponent: 2

0 → 2 : DC

Amp: 2

2 → 4 : General Order Polynomial

Max Power: 2

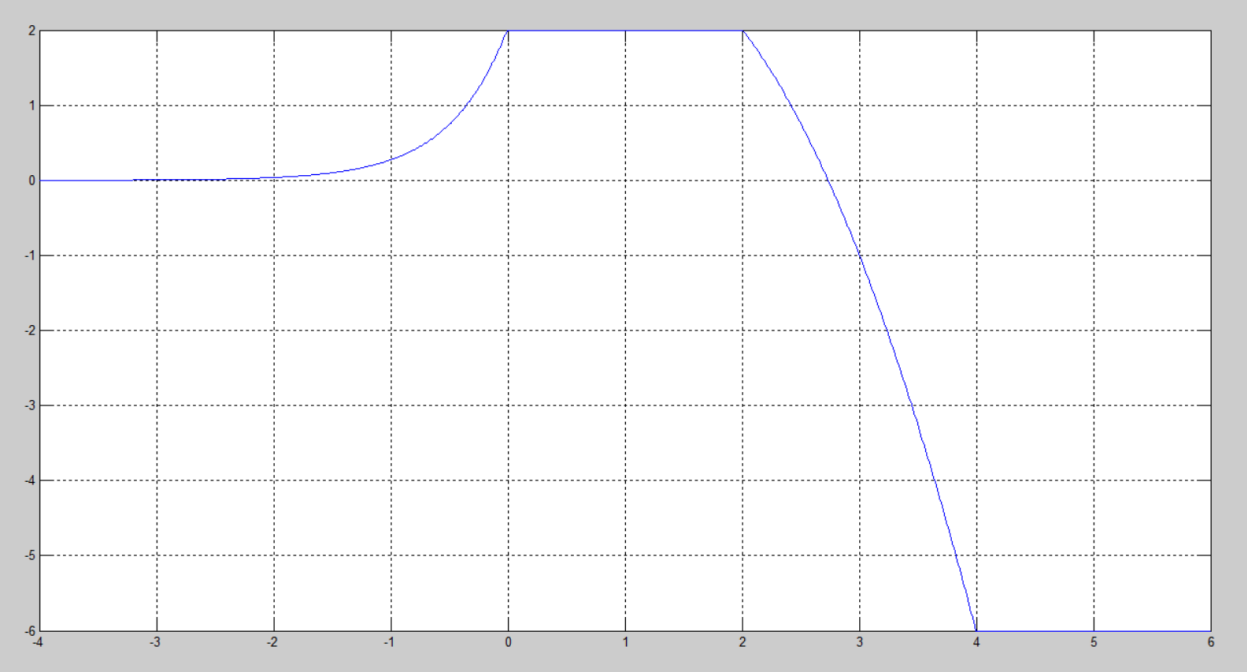
X squared coefficient: -1

X coefficient: 2

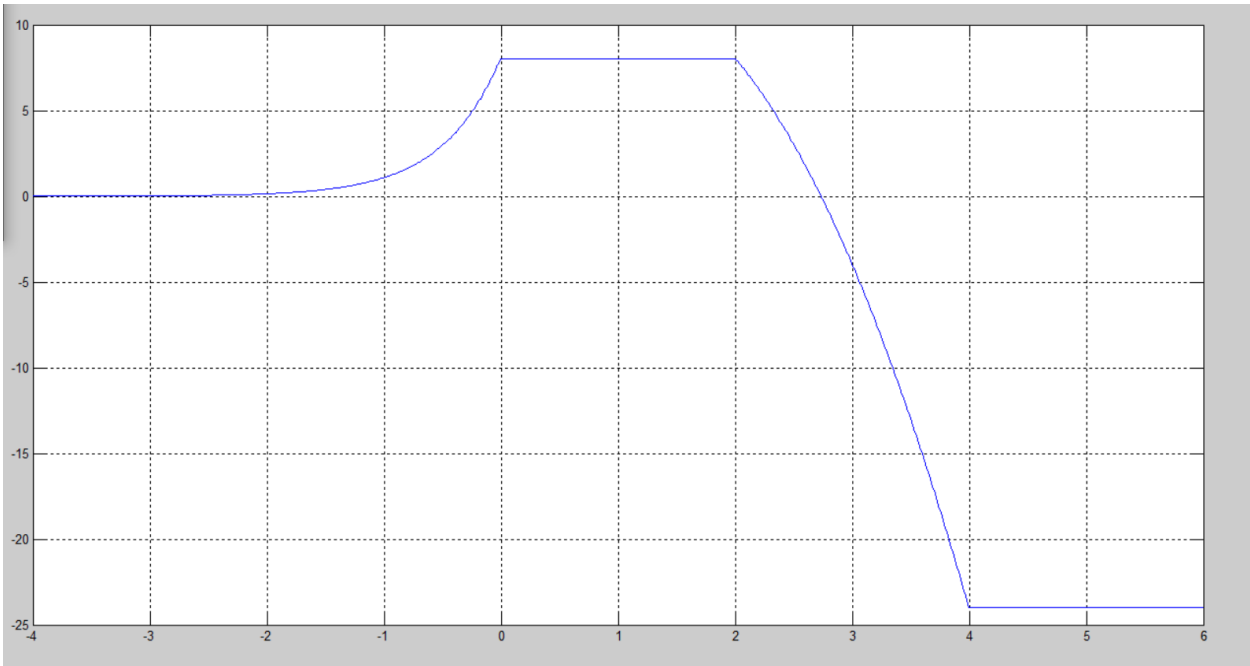
Intercept: 2

4 → 6 : DC

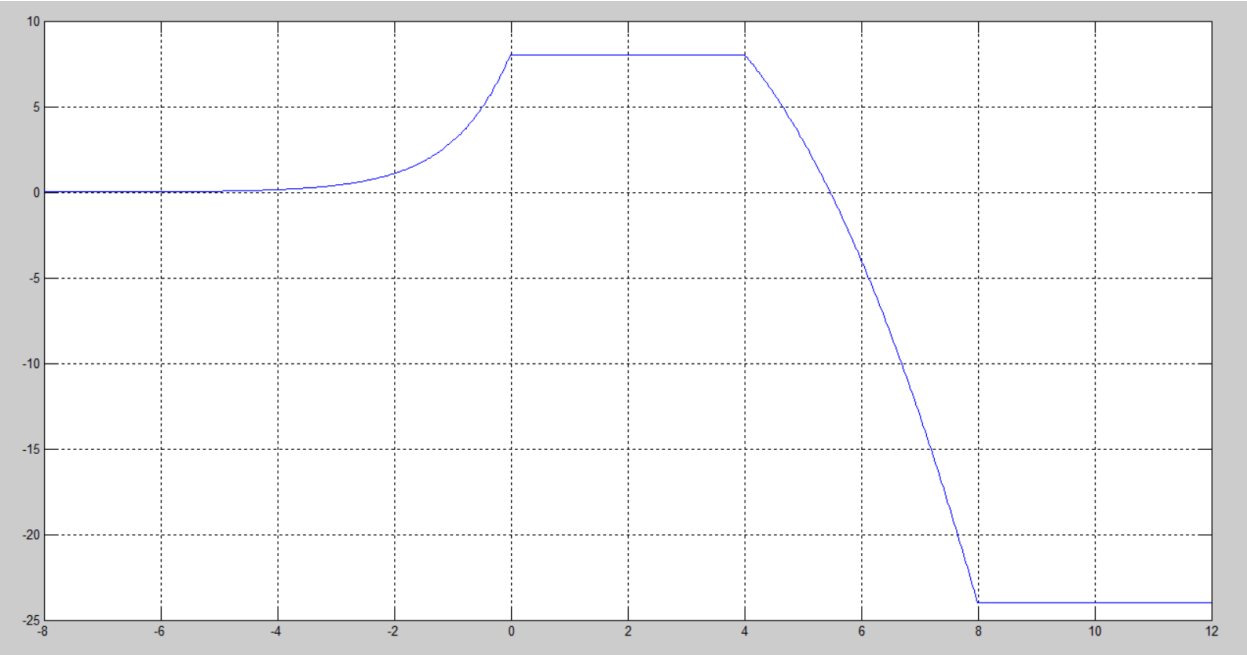
Amp -6



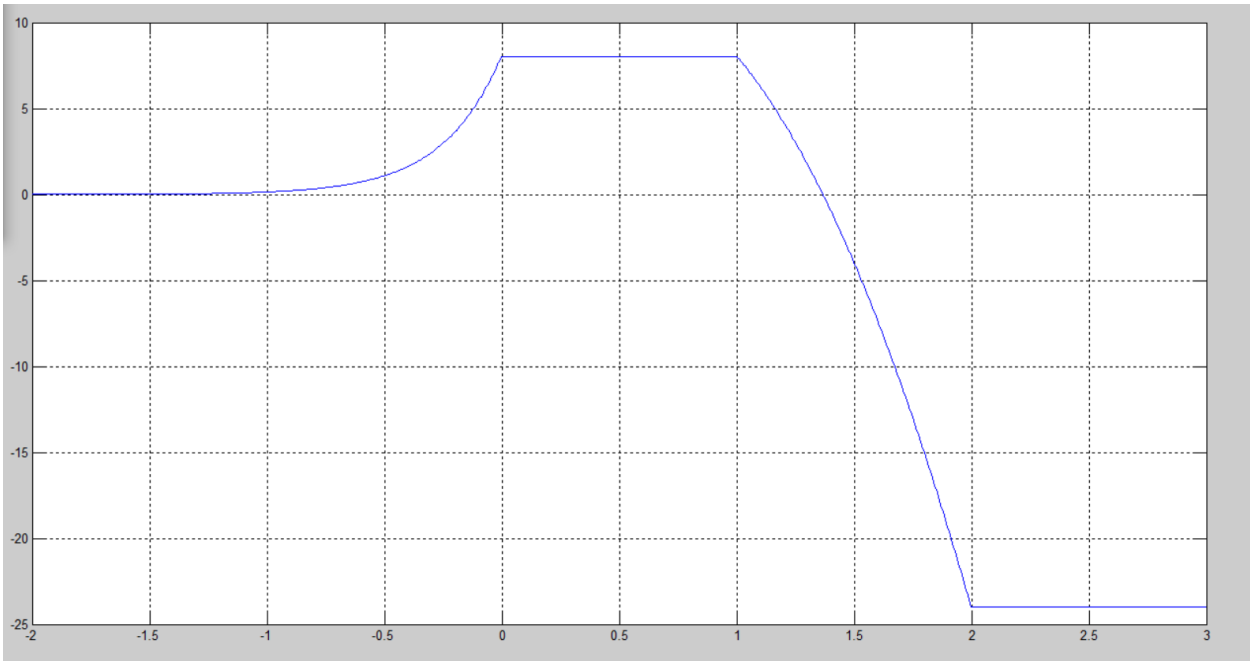
Amplitude Scaling by 4



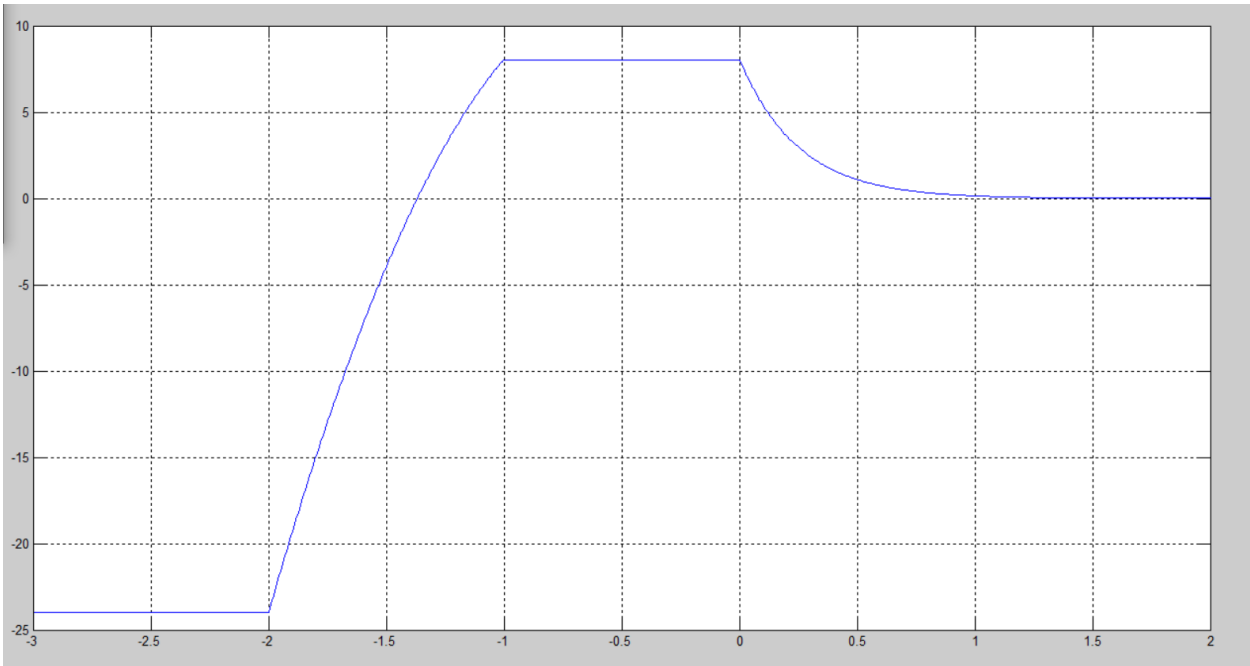
Expand by 2



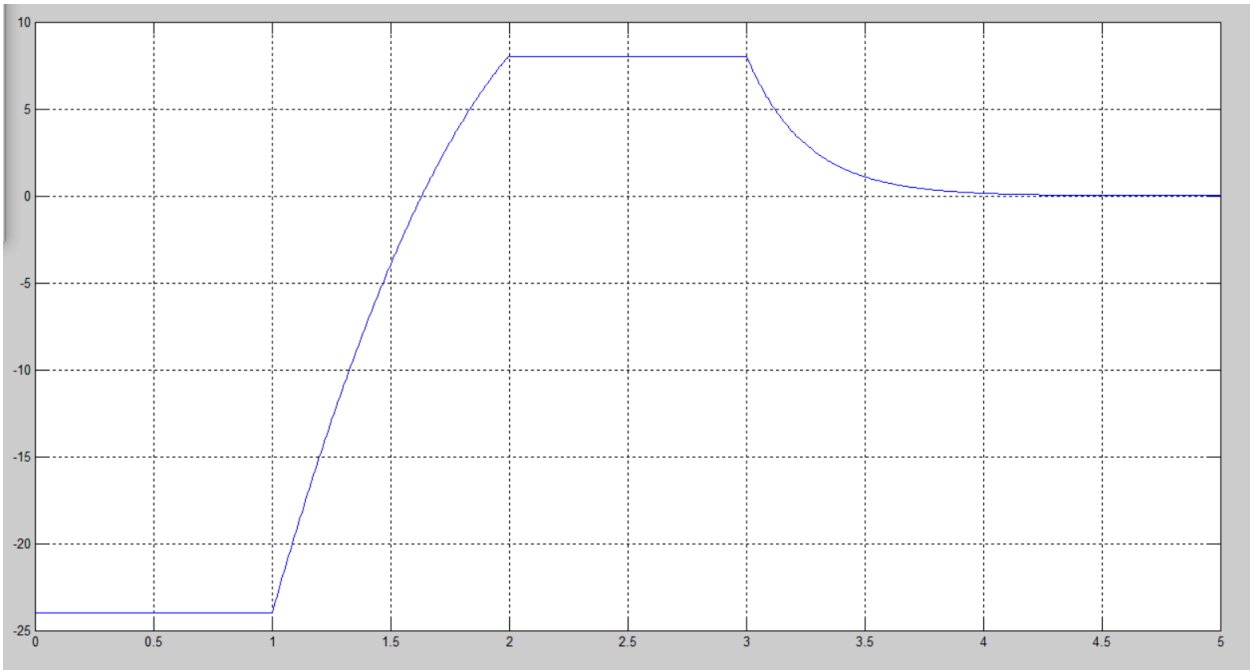
Compress by 4



Time Reversal



Time Shift by 3



Test 6

Start: 0

End: 10

Number of Break Points: 3

0 → 2 : sinusoidal

Amp: 2

Frequency: 0.25

Phase: 0

2 → 4 : General Order Polynomial

Max Power: 2

X squared coefficient: 1

X coefficient: -2

Intercept: -2

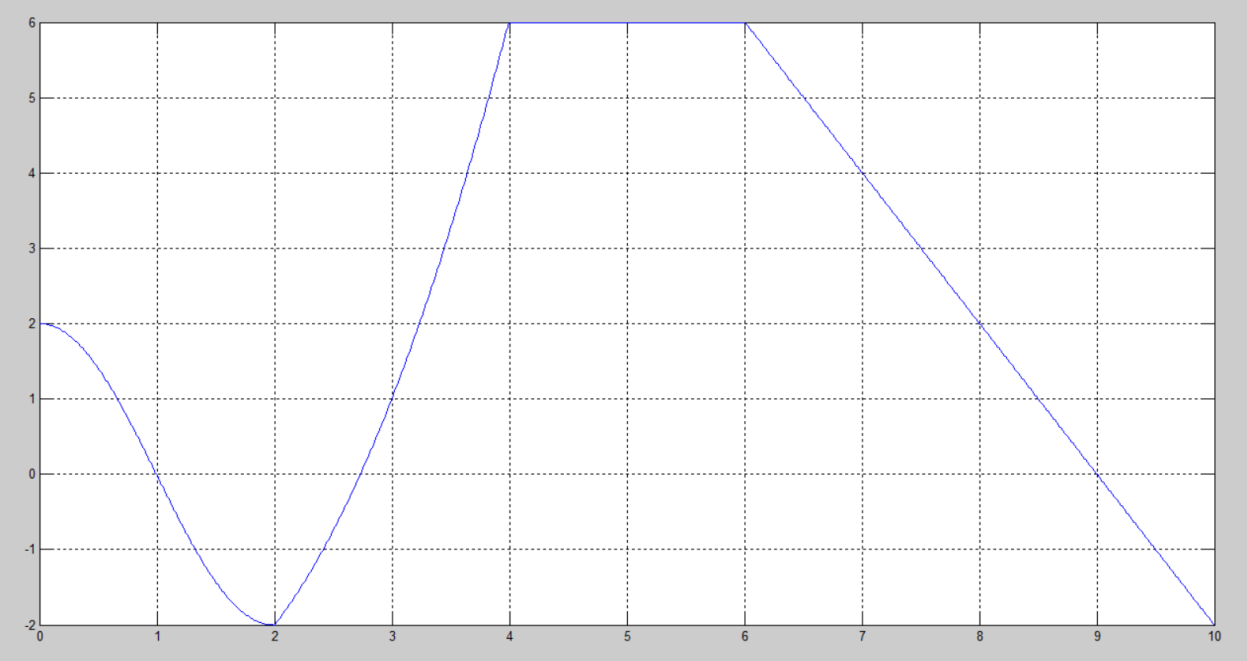
4 → 6 : DC

Amp: 6

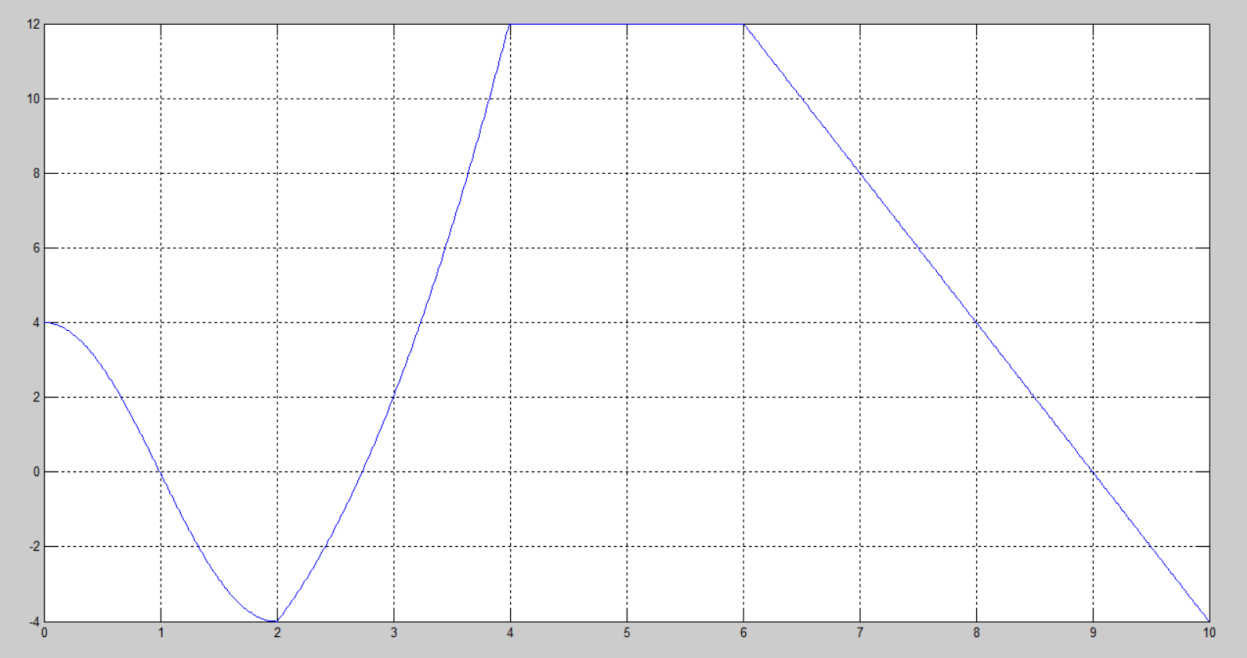
6 → 10 : Ramp

Slope: -2

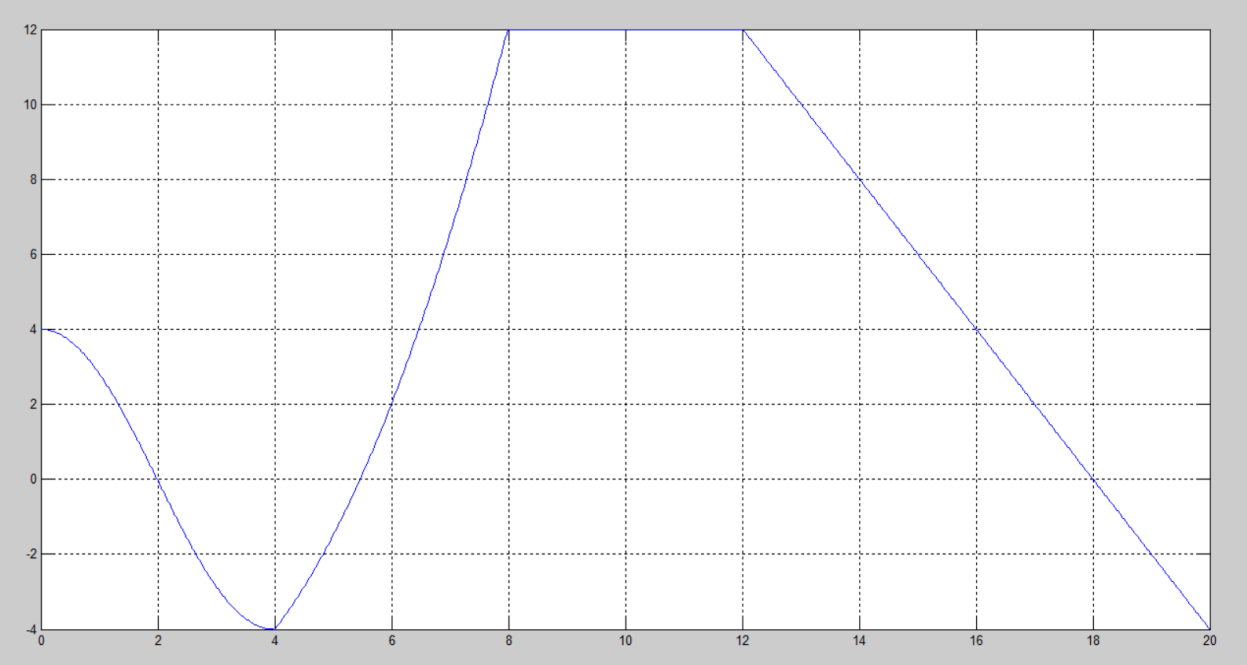
Intercept: 18



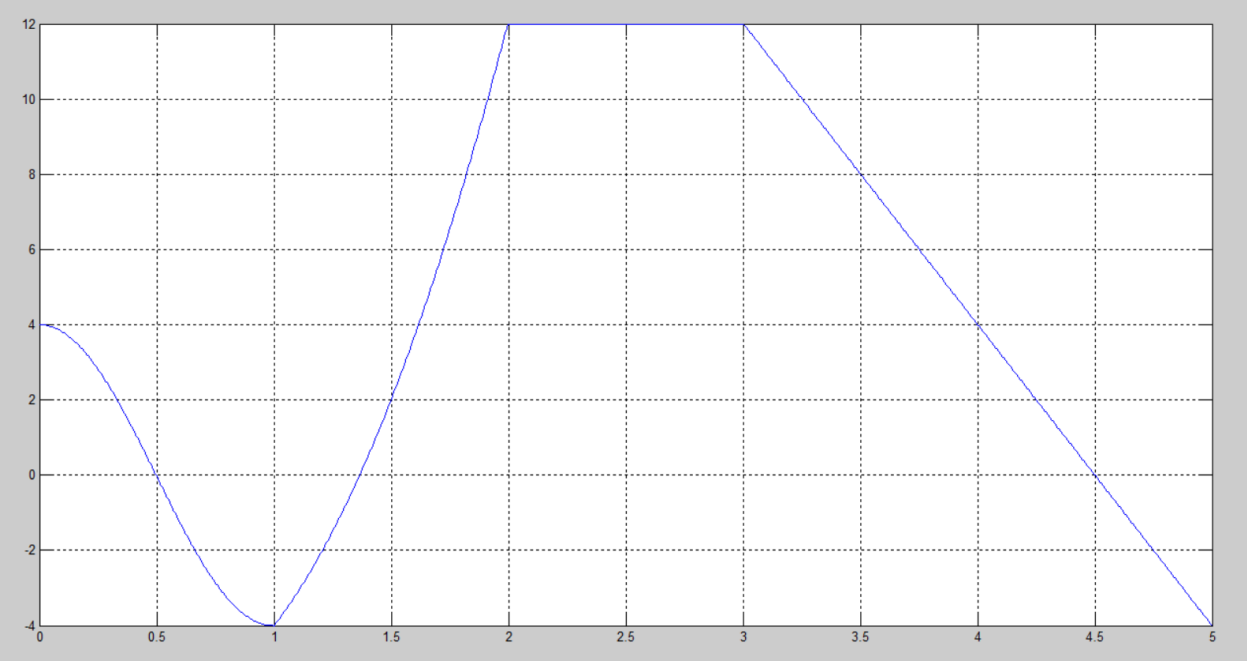
Amplitude Scaling by 2



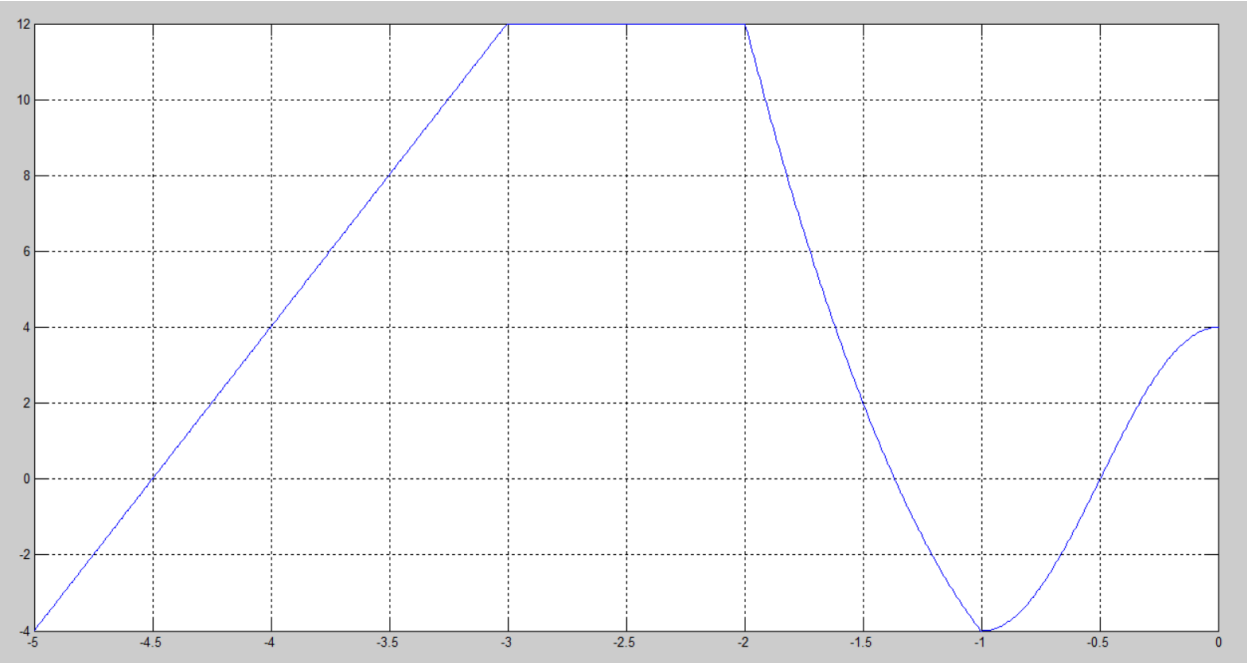
Expand by 2



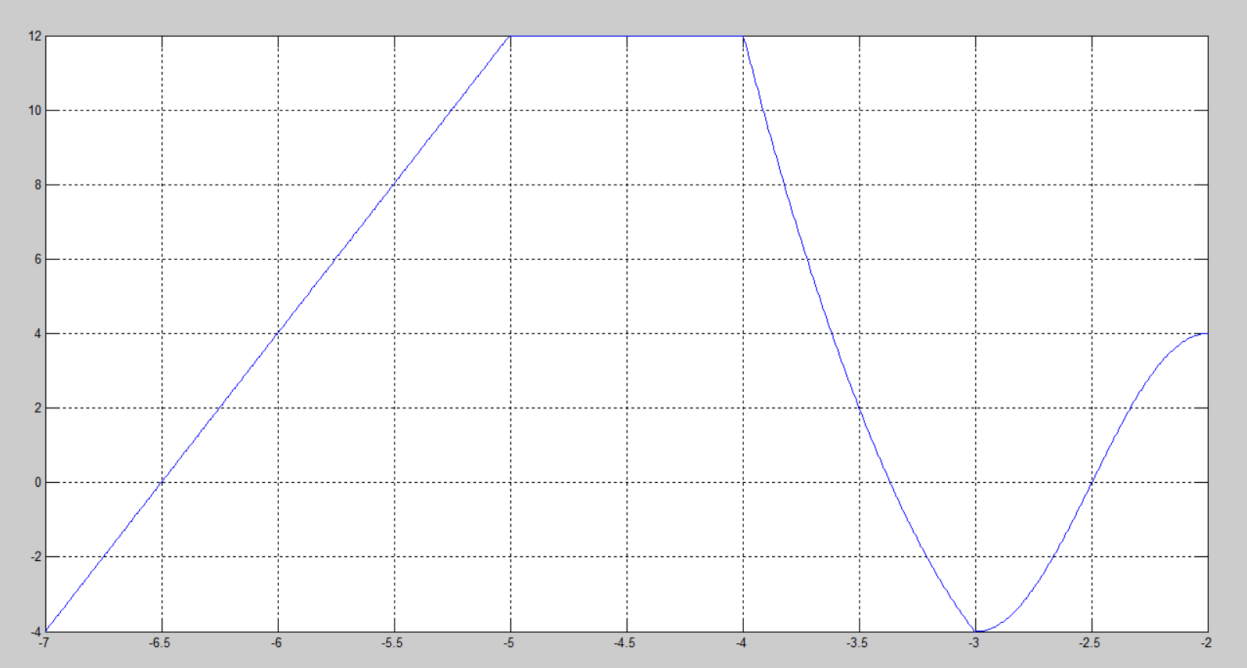
Compress by 4



Time Reversal



Time Shift by -2



Test 7

Start: 0

End: 12

Number of Break Points: 4

0 → 2 : Sinusoidal

Amp: 2

Frequency: 0.25

Phase: 180

2 → 4 : DC

Amp: 2

4 → 6 : General Order Polynomial

Max Power: 2

X squared coefficient: -1

X coefficient: 4

Intercept: 2

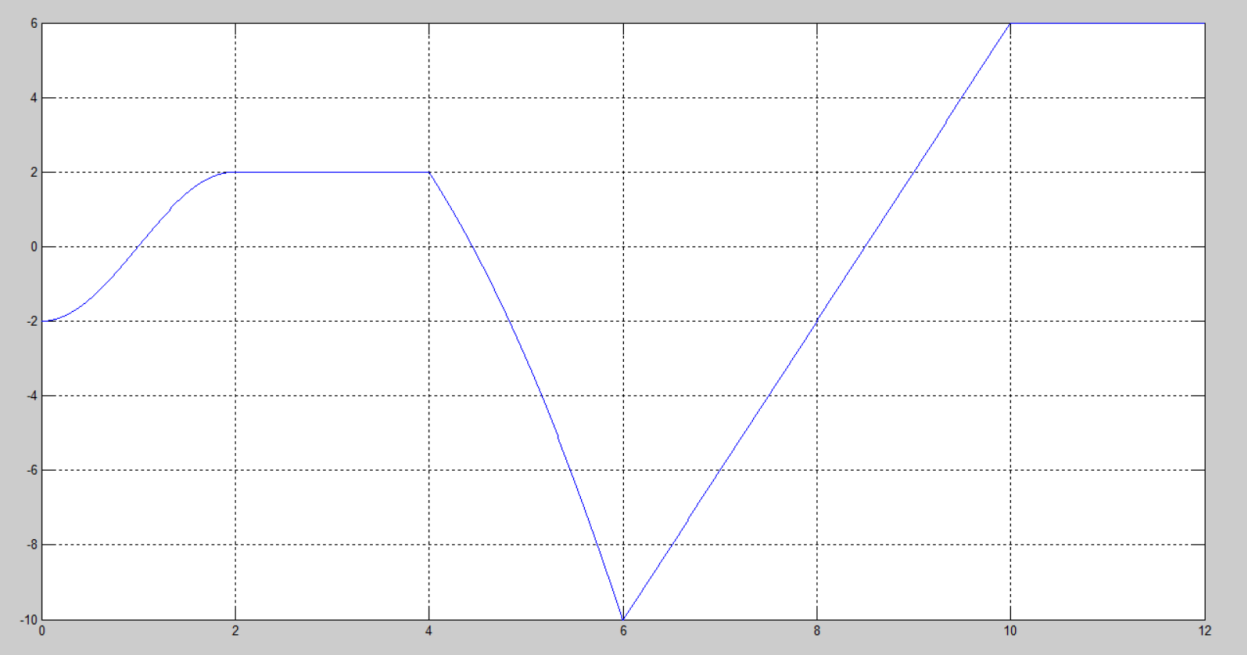
6 → 10 : Ramp

Slope: 4

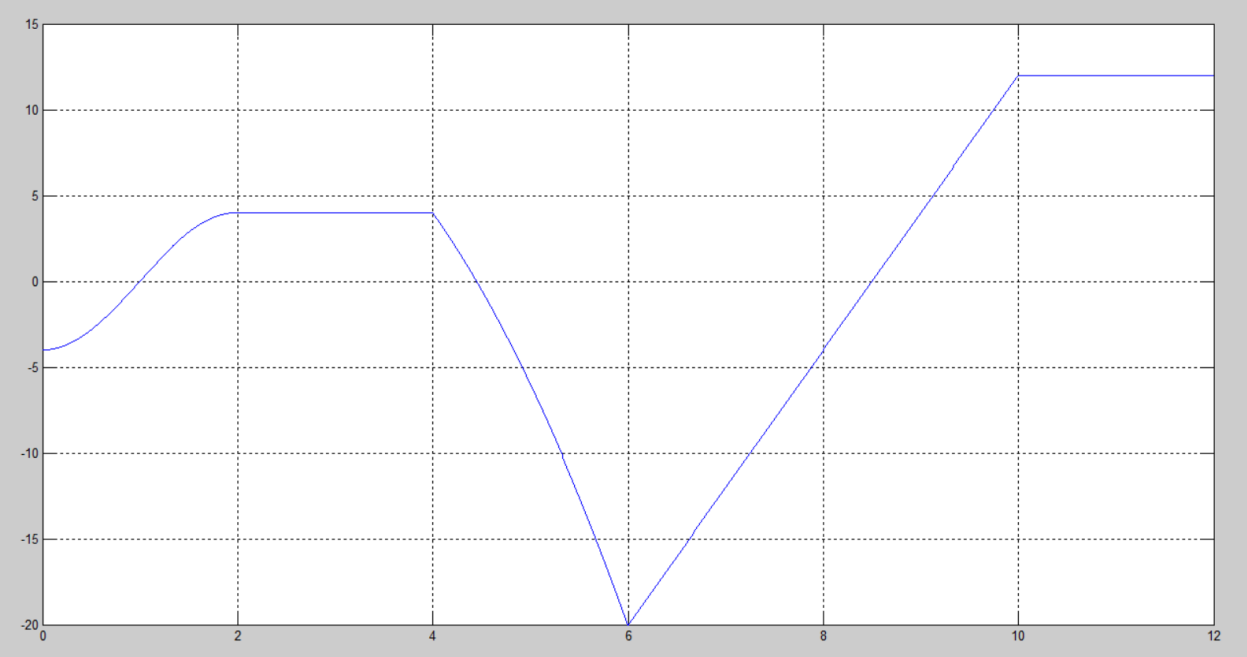
Intercept: -34

10 → 12 : DC

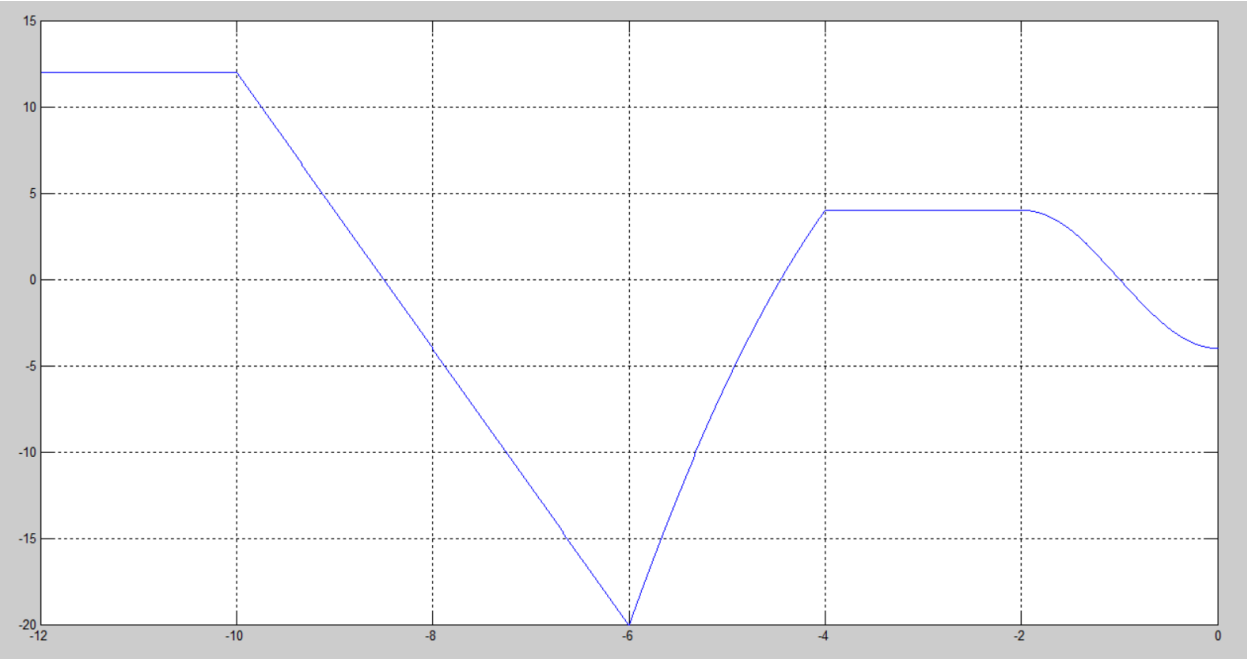
Amp: 6



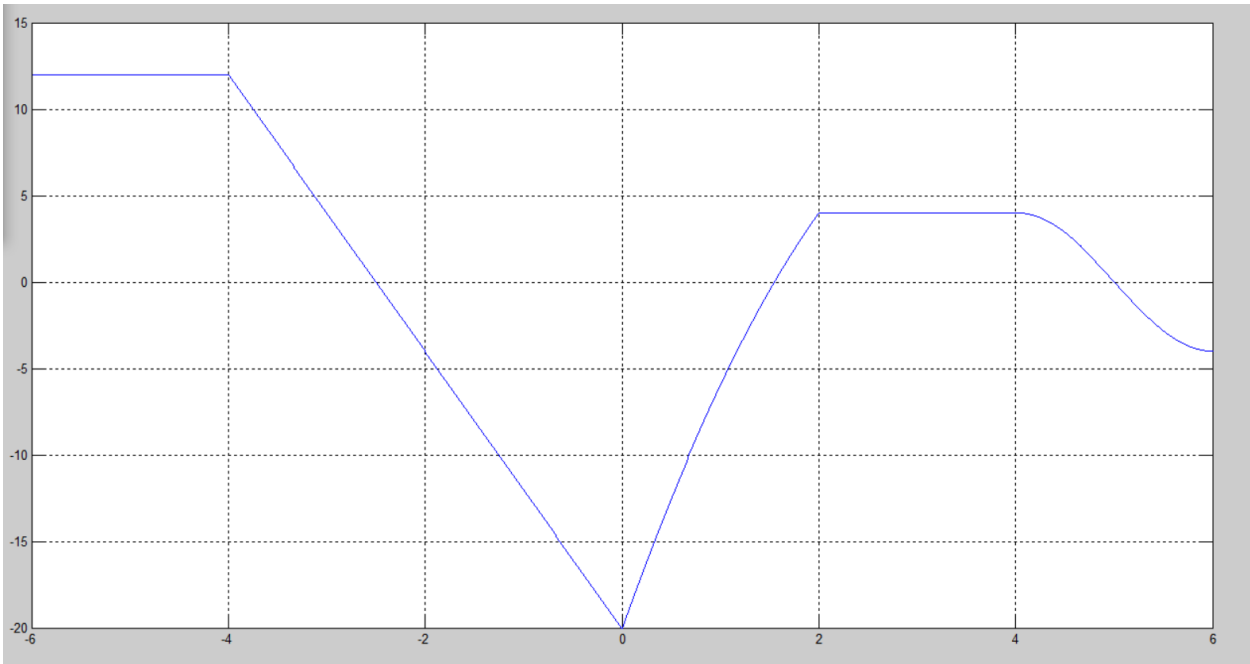
Amplitude Scaling by 2



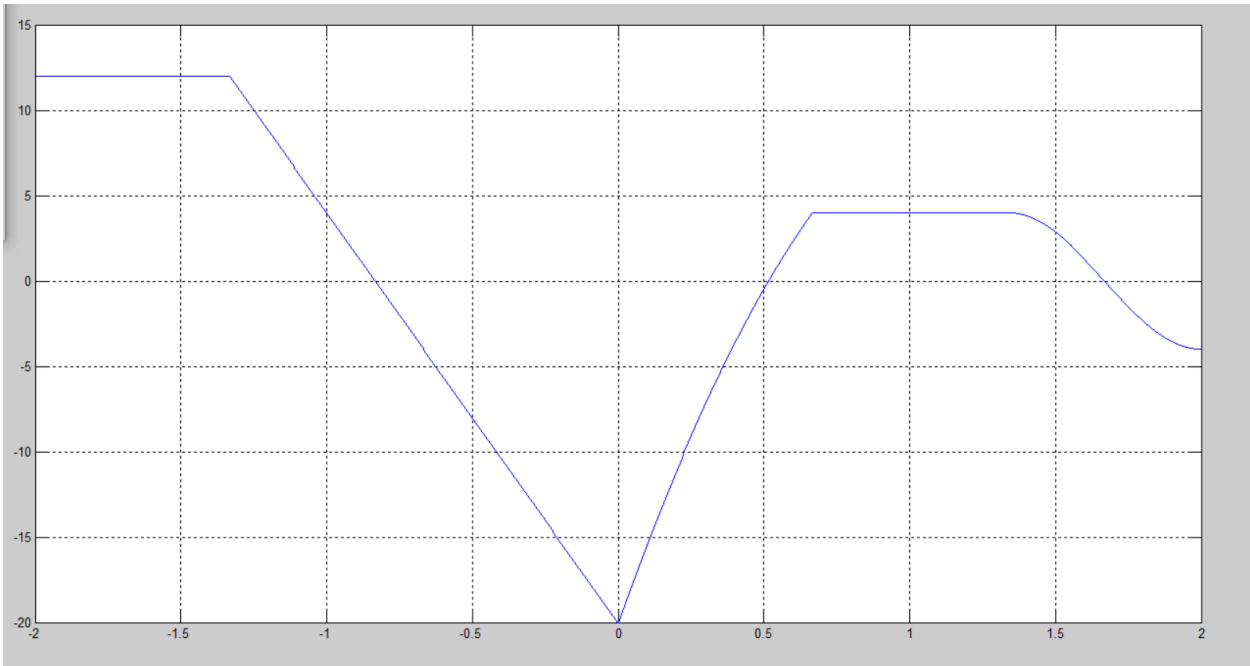
Time Reversal



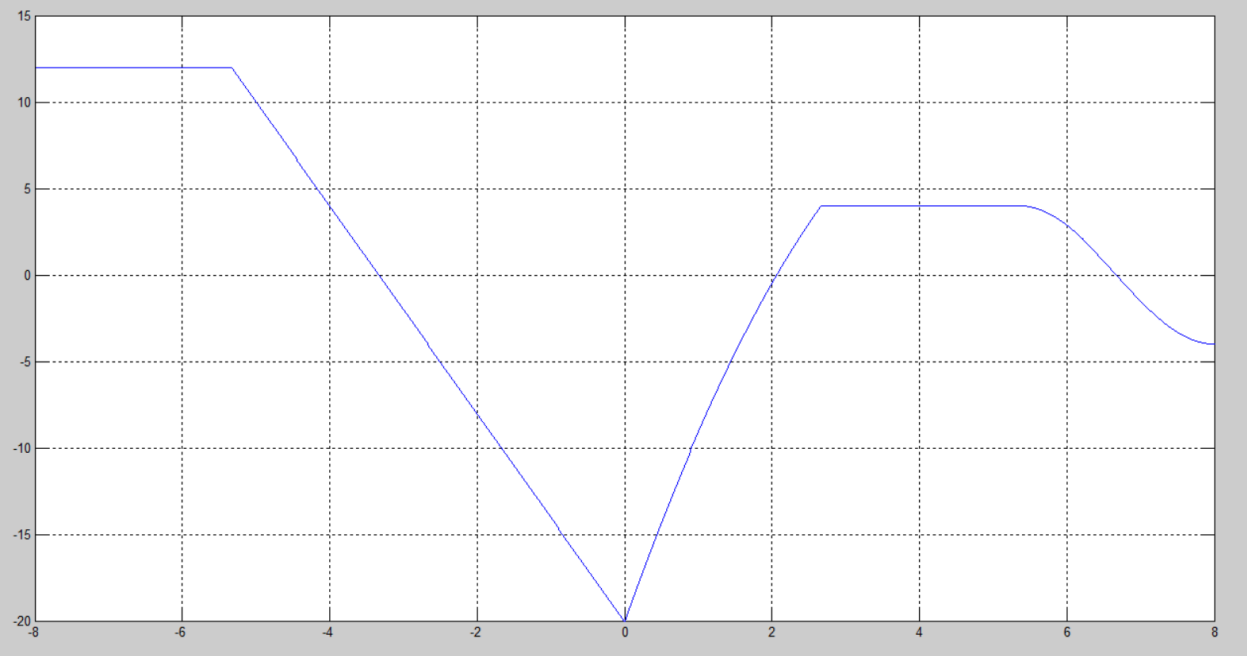
Time Shift by 6



Compress by 3



Expand by 4



Test 8

Start: -2

End: 15

Number of Break Points: 4

-2 → 0 : Exp

Amp: 3

Exponent: 2

0 → 2 : General Order Polynomial

Max Power: 4

X power 4 coefficient: -1

X power 3 coefficient: 0

X squared coefficient: 1

X coefficient: 1

Intercept: 3

2 → 5 : Ramp

Slope: 2

Intercept: -11

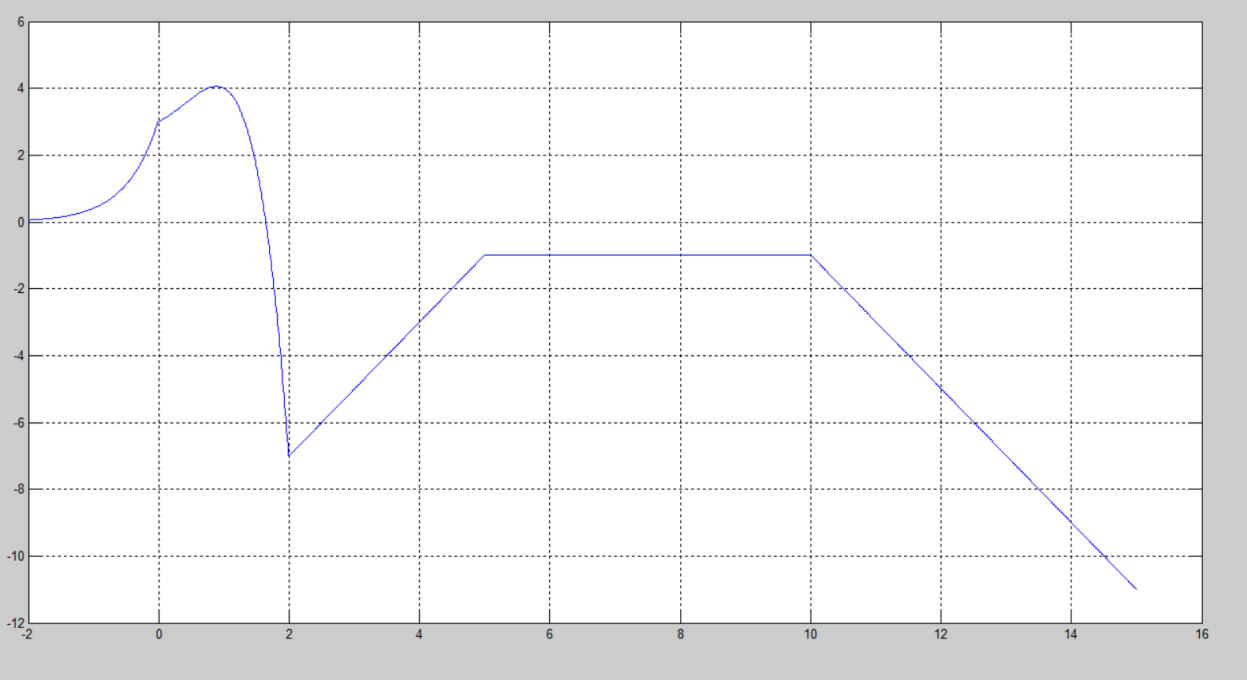
5 → 10 : DC

Amp: -1

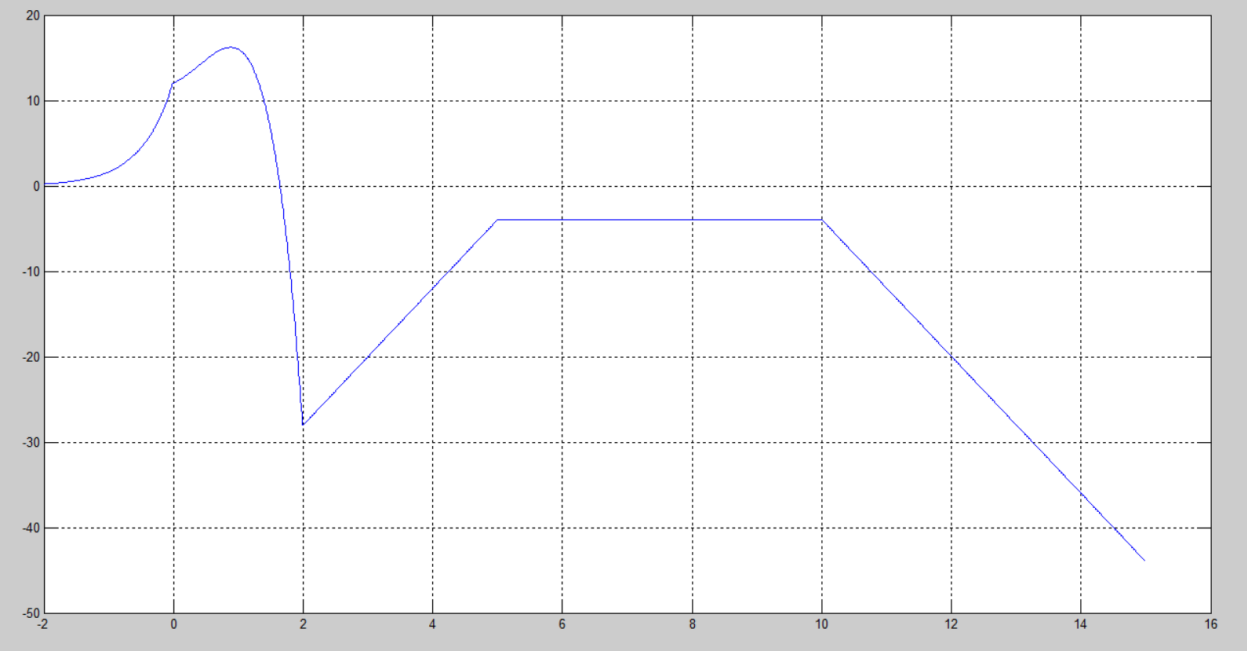
10 → 15 : Ramp

Slope: -2

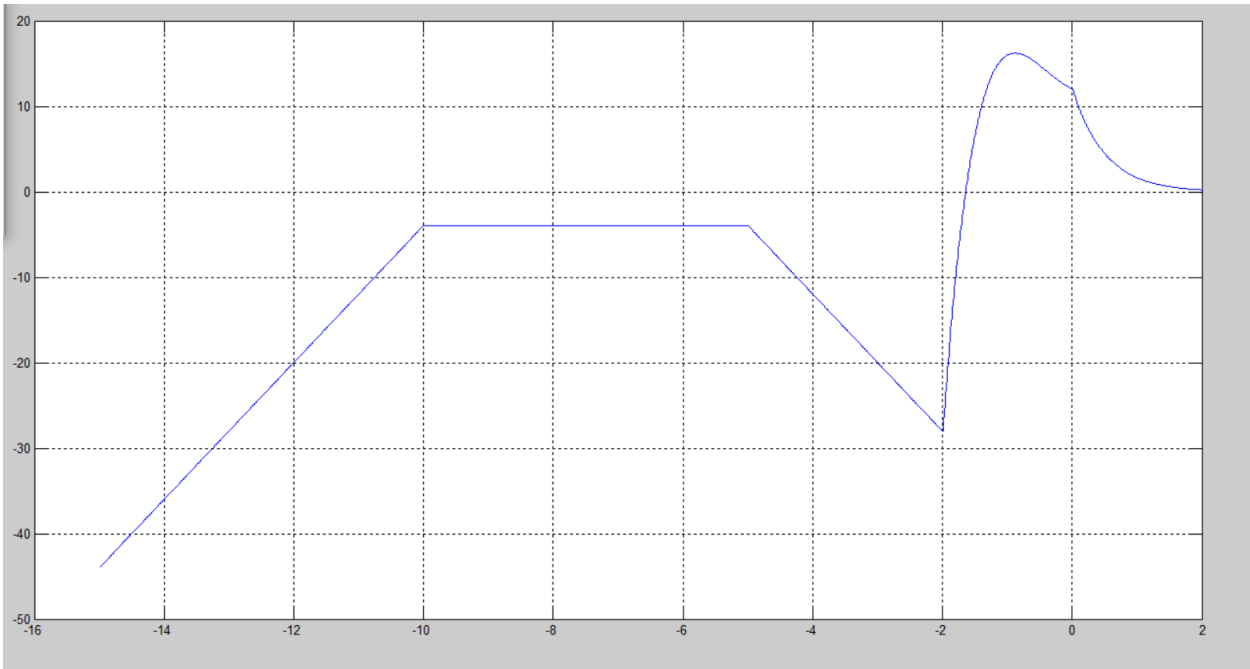
Intercept: 19



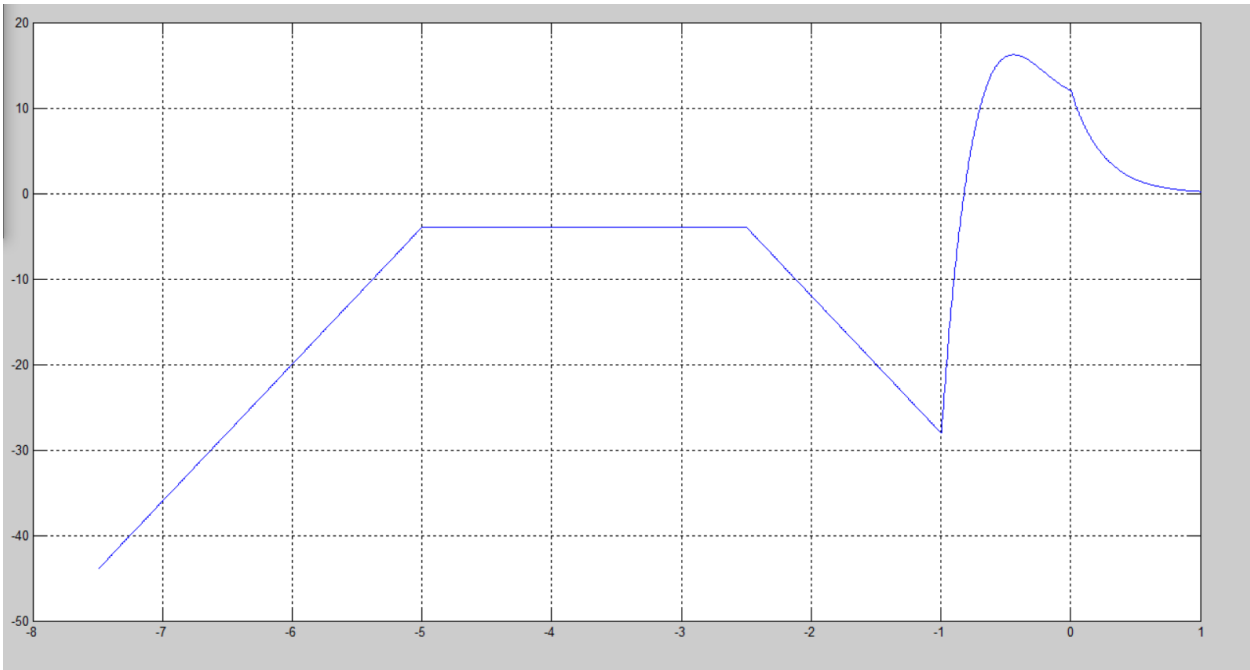
Amplitude Sacling by 4



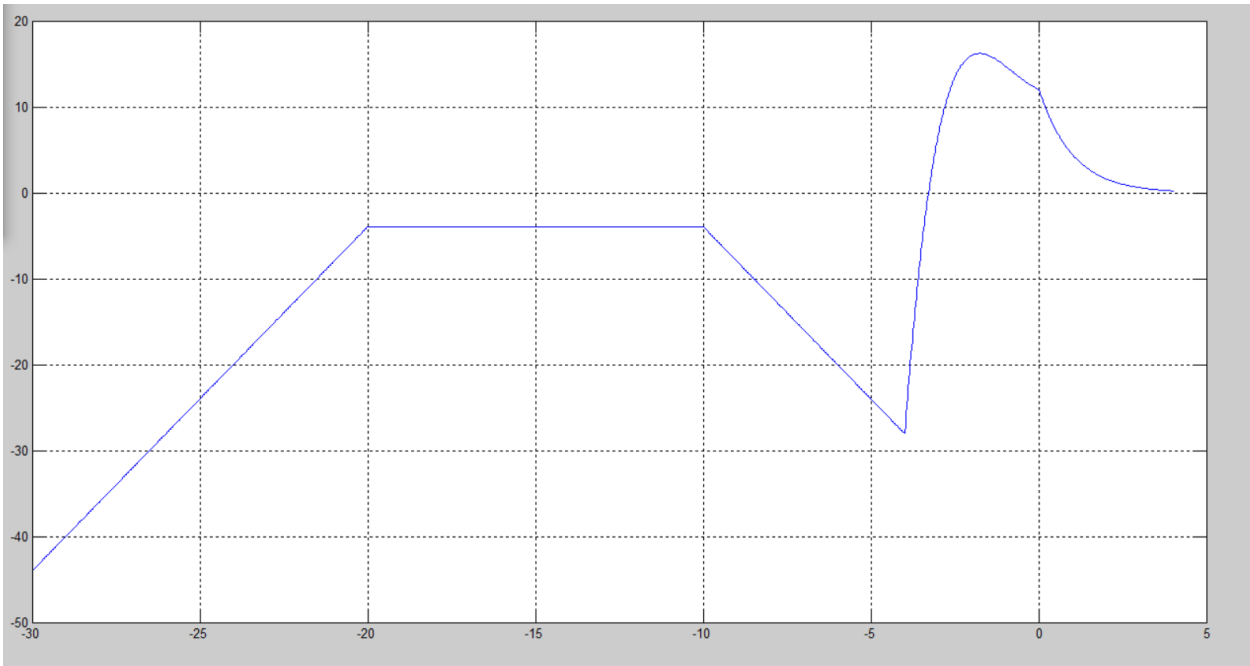
Time Reversal



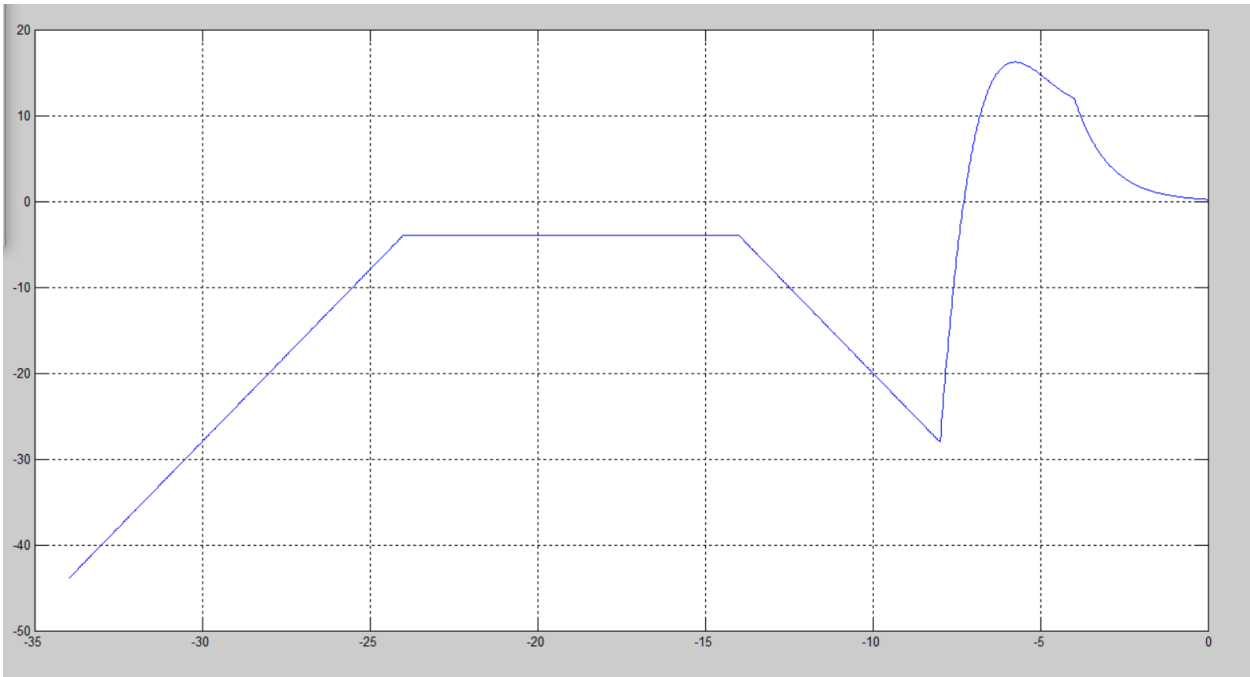
Compress by 2



Expand by 4



Time Shift by -4



Test 9

Start: -4

End: 16

Number of Break Points: 5

-4 → 0 : DC

Amp: 2

0 → 2 : Ramp

Slope: -3

Intercept: 2

2 → 4 : Sinusoidal

Amp: 4

Frequency: 0.25

Phase: 0

4 → 10 : Ramp

Slope: -1

Intercept: 8

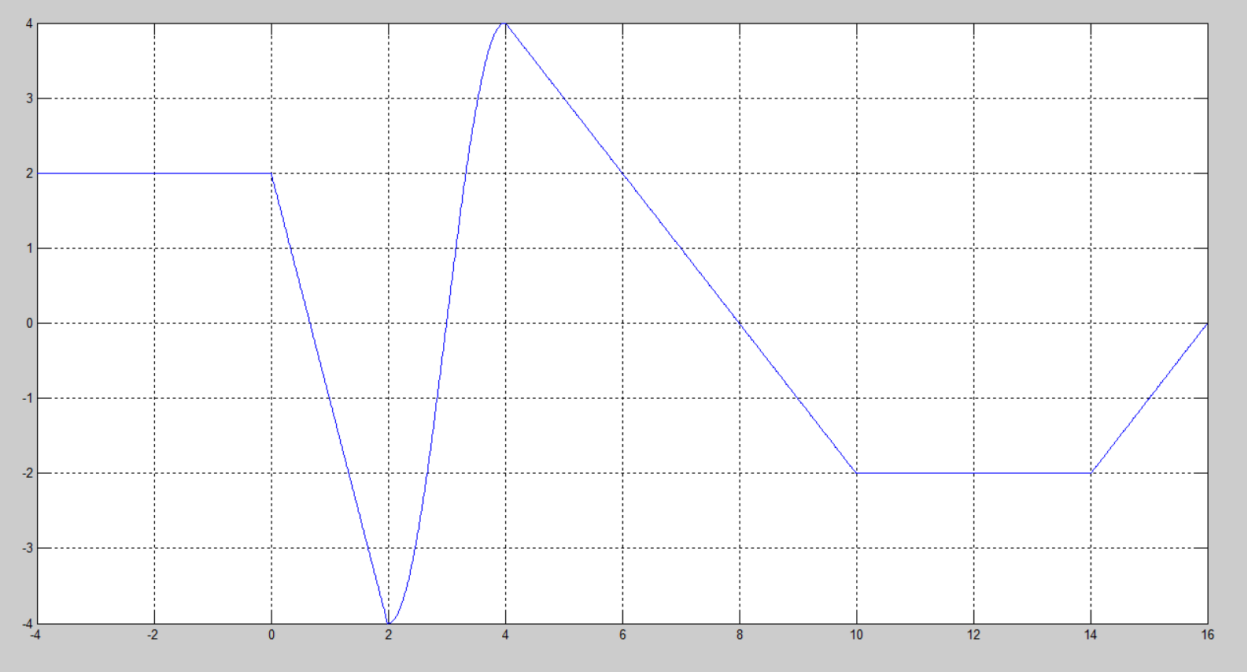
10 → 14 : DC

Amp: -2

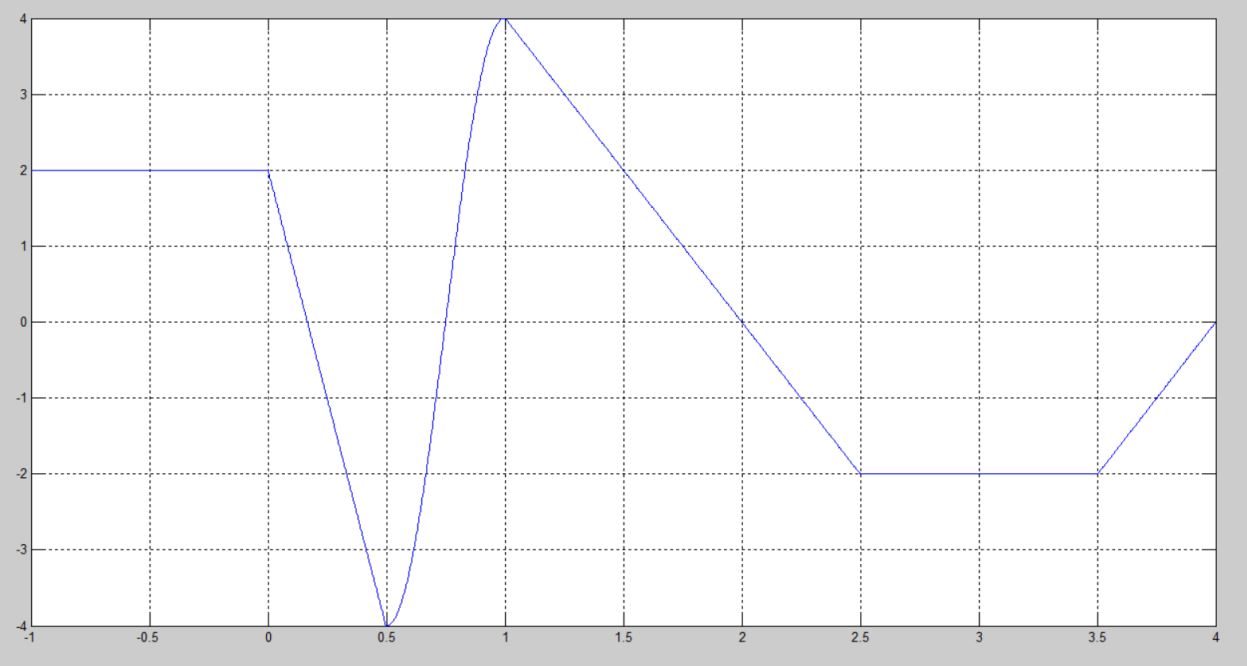
14 → 16 : Ramp

Slope: 1

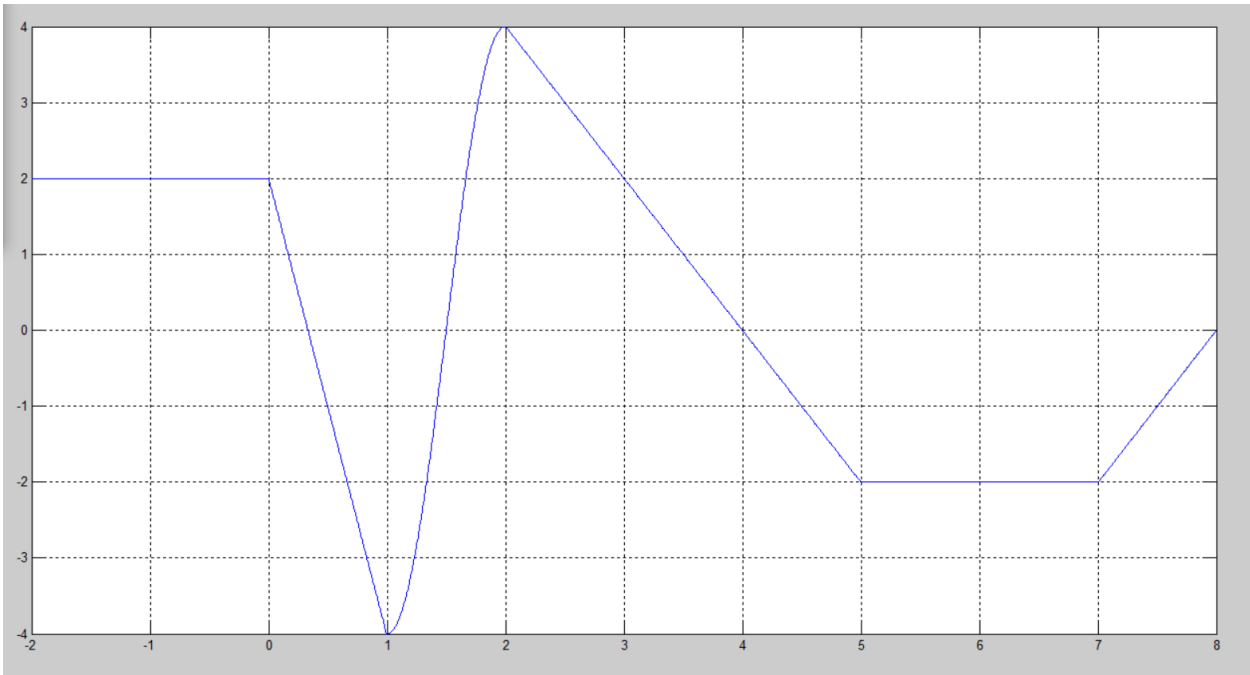
Intercept: -16



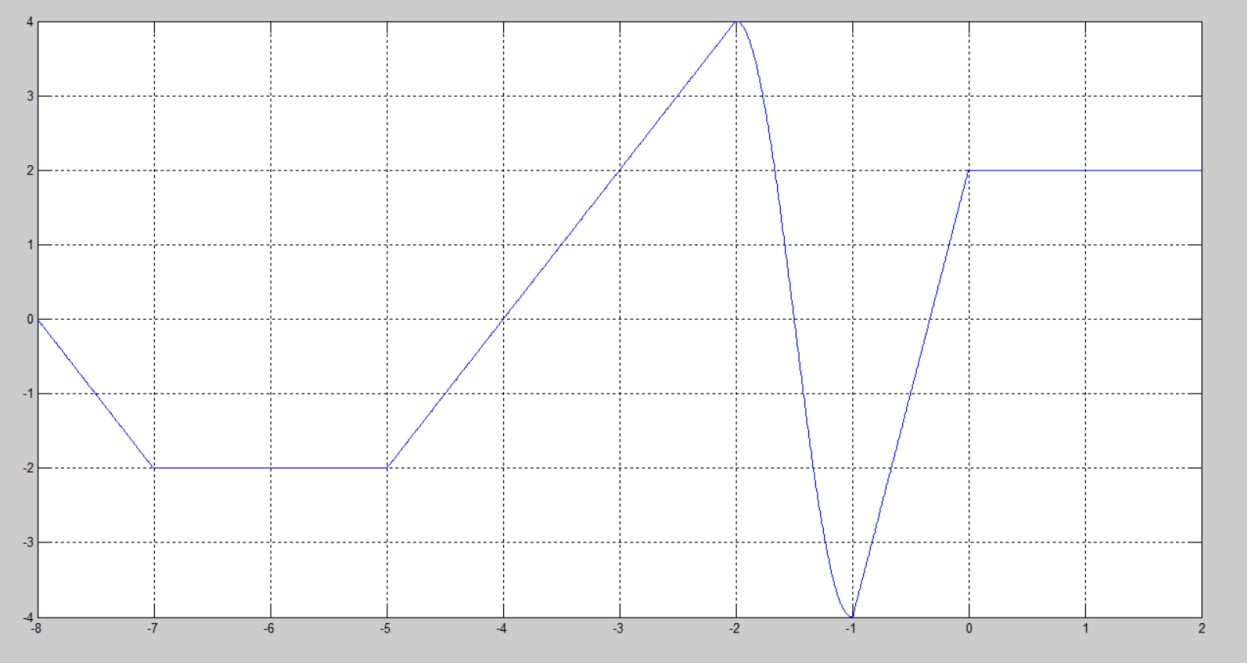
Compress by 4



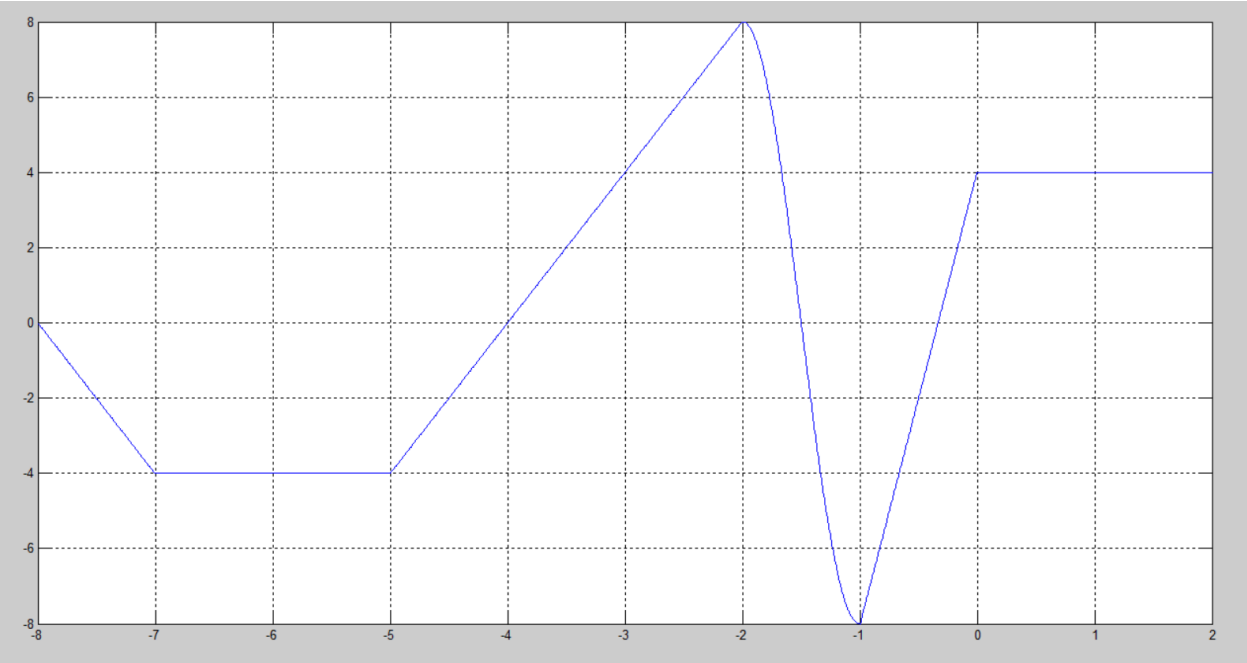
Expand by 2



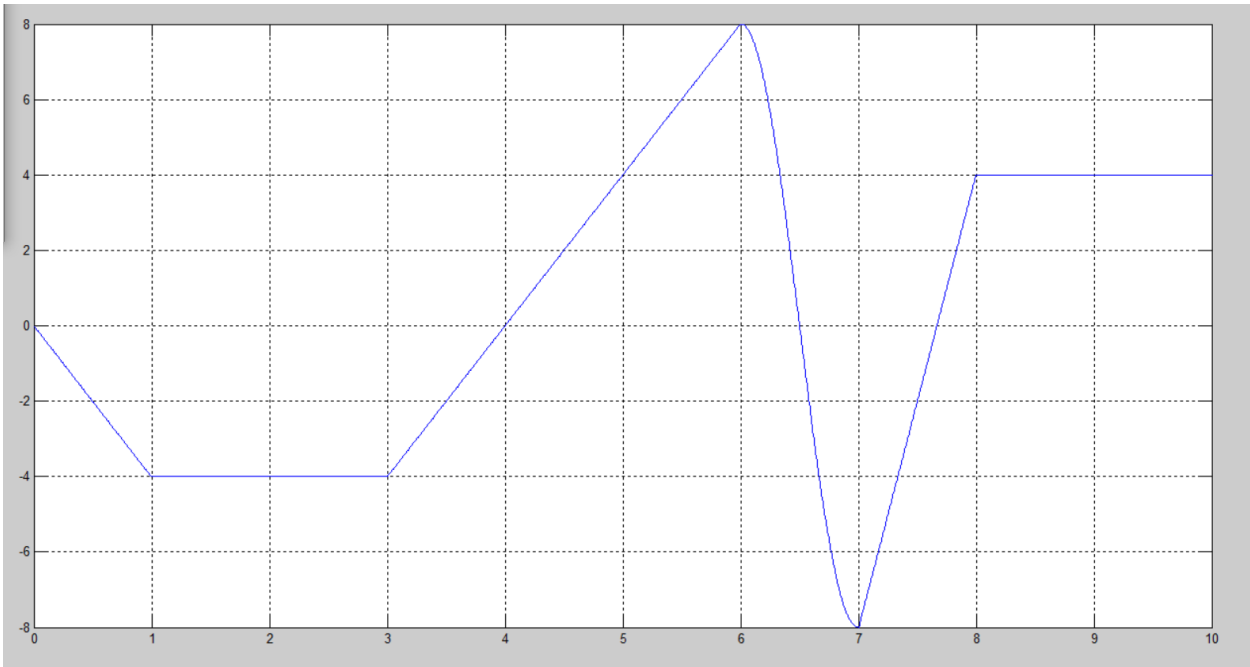
Time Reversal



Amplitude Scaling by 2



Time Shift by 8



Test 10

Start: -4

End: 24

Number of Break Points: 7

-4 → 0 : Exp

Amp: 6

Exponent: 4

0 → 2 : Sinusoidal

Amp: 6

Frequency: 0.25

Phase: 0

2 → 6 : DC

Amp: -6

6 → 10 : Ramp

Slope: 2

Intercept: -18

10 → 14 : Ramp

Slope: -2

Intercept: 22

14 → 16 : DC

Amp: -6

16 → 20 : Ramp

Slope: 2

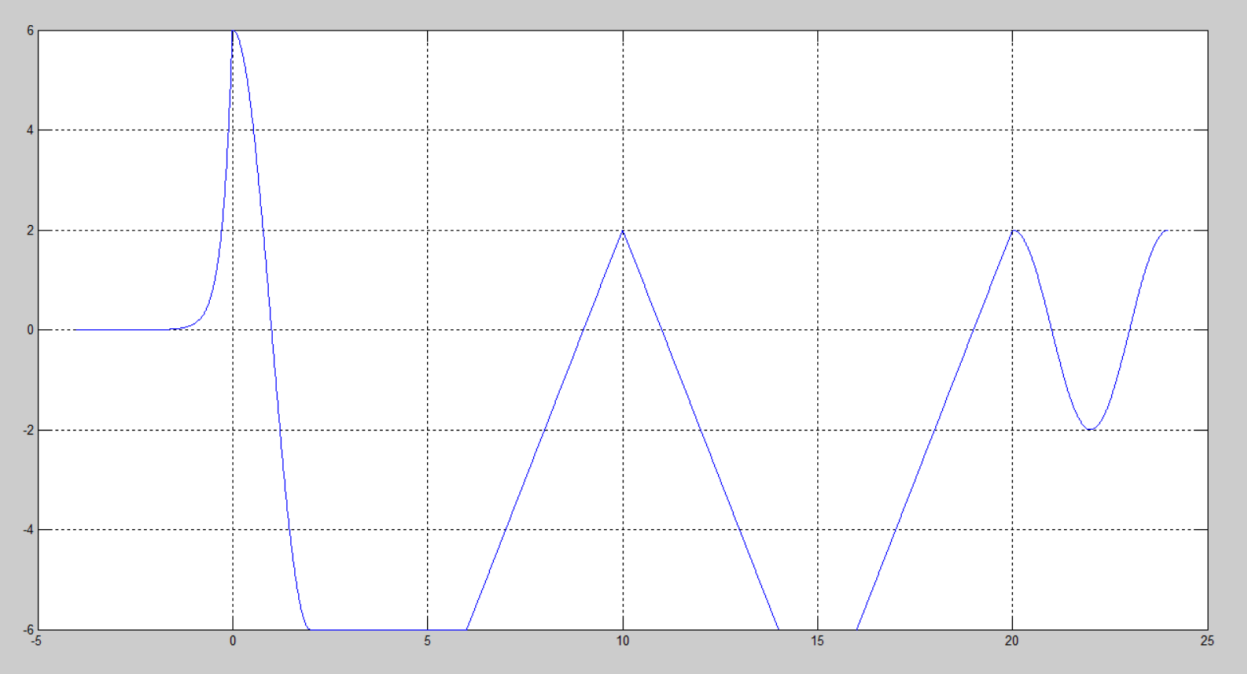
Intercept: -38

20 → 24 : Sinusoidal

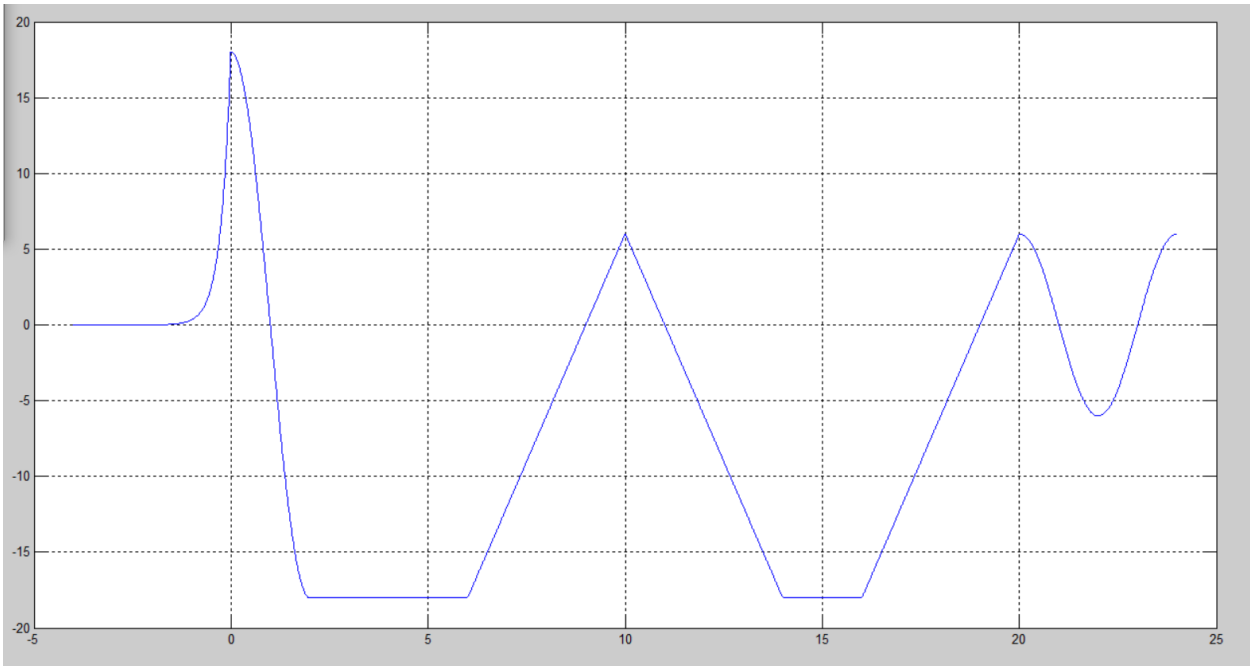
Amp: 2

Frequency: 0.25

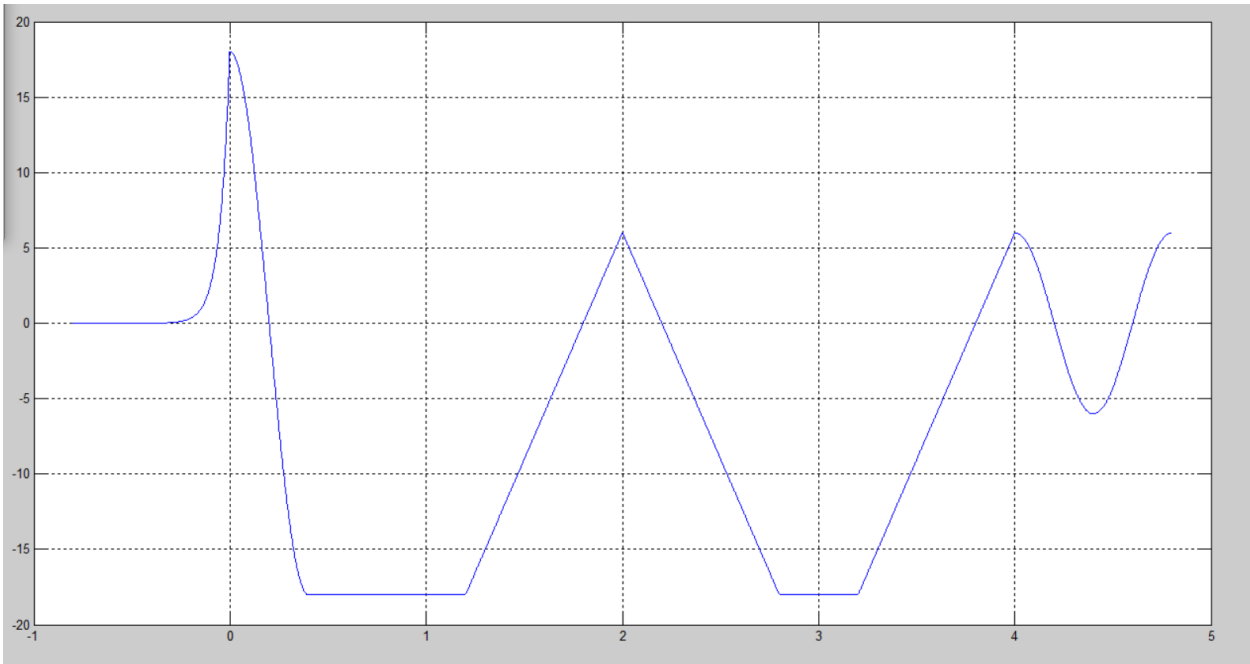
Phase: 0



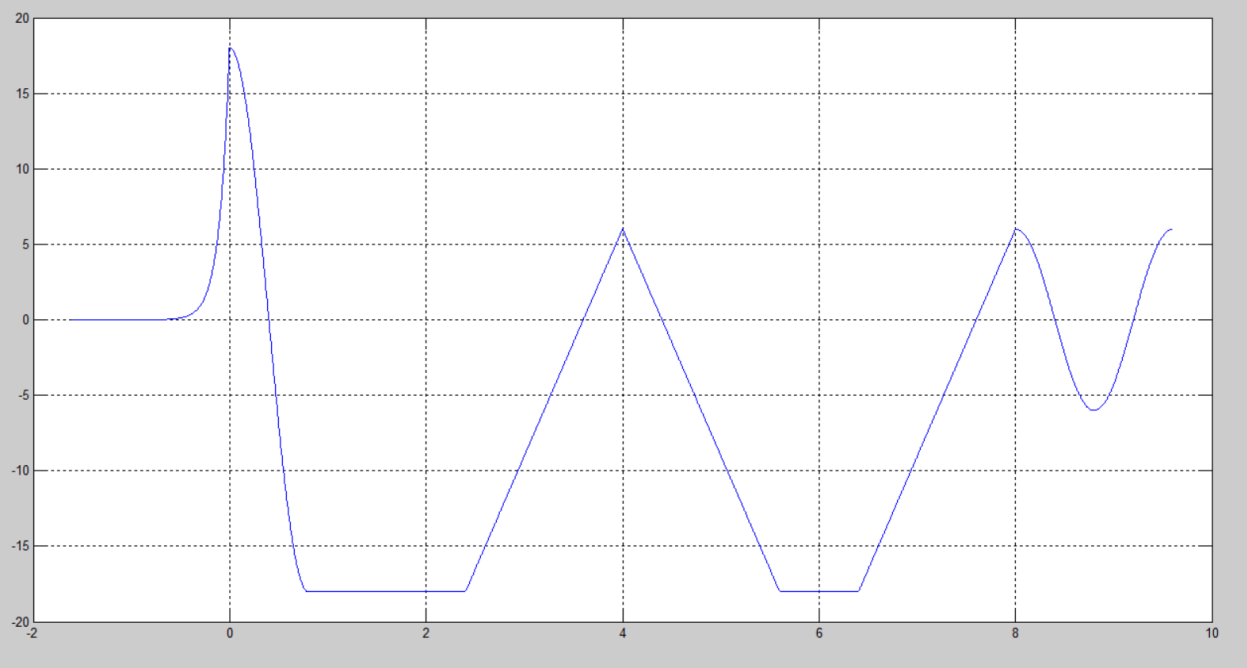
Amplitude Scaling by 3



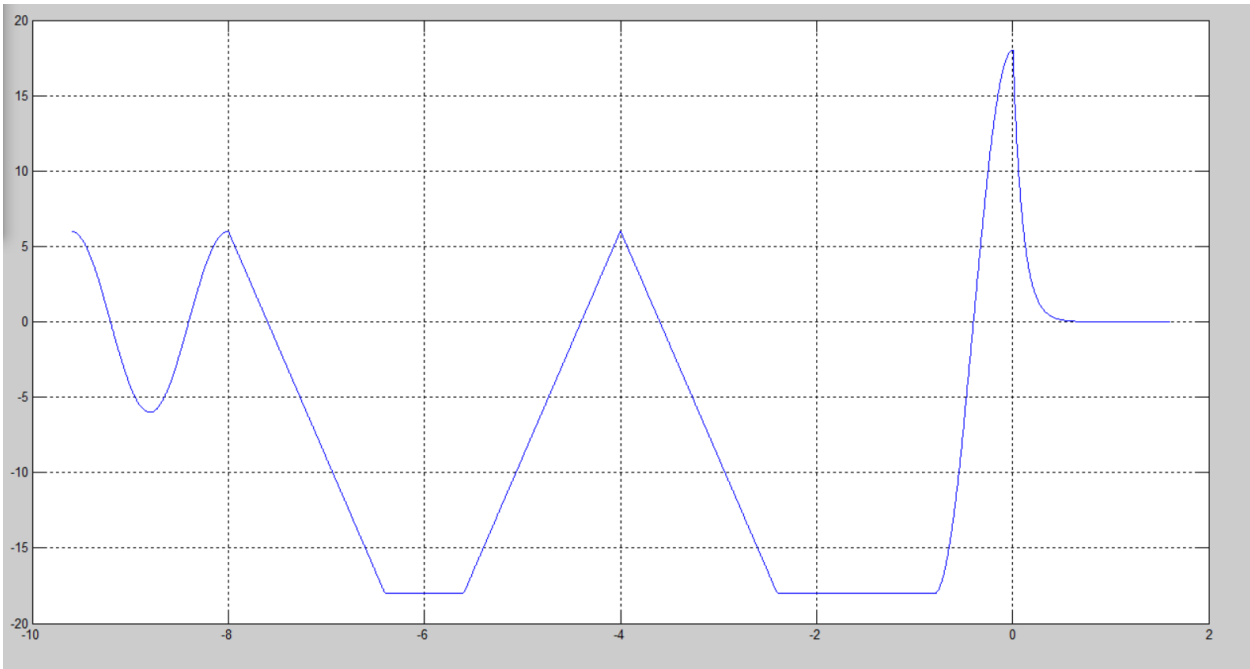
Compress by 5



Expand by 2



Time Reversal



Time Shift by -2