ELEN110L - Lab3: More Convolution

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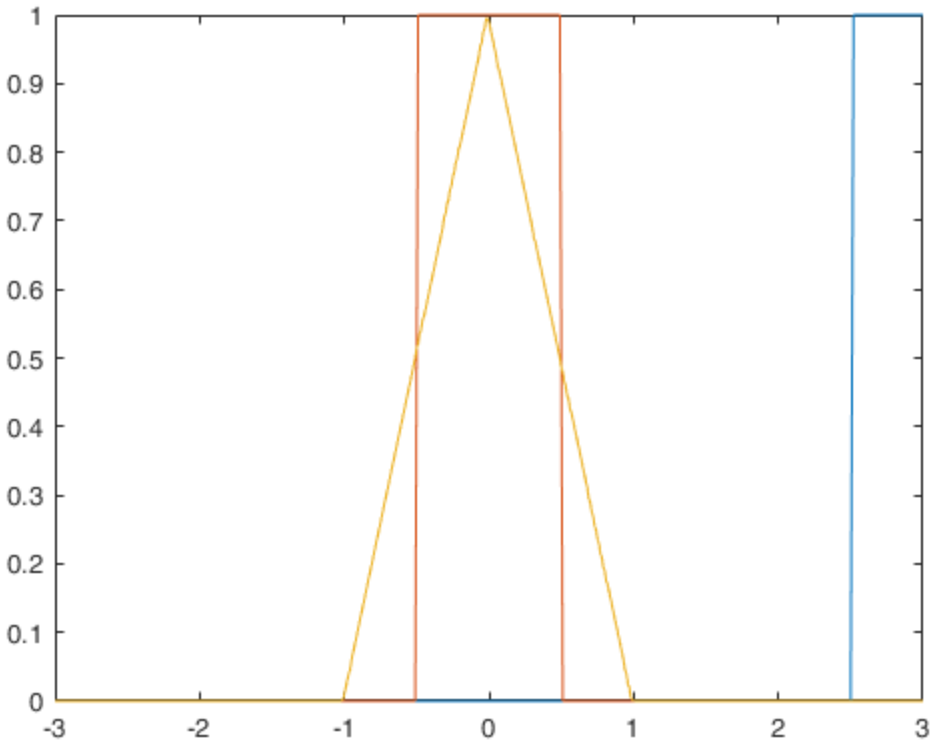
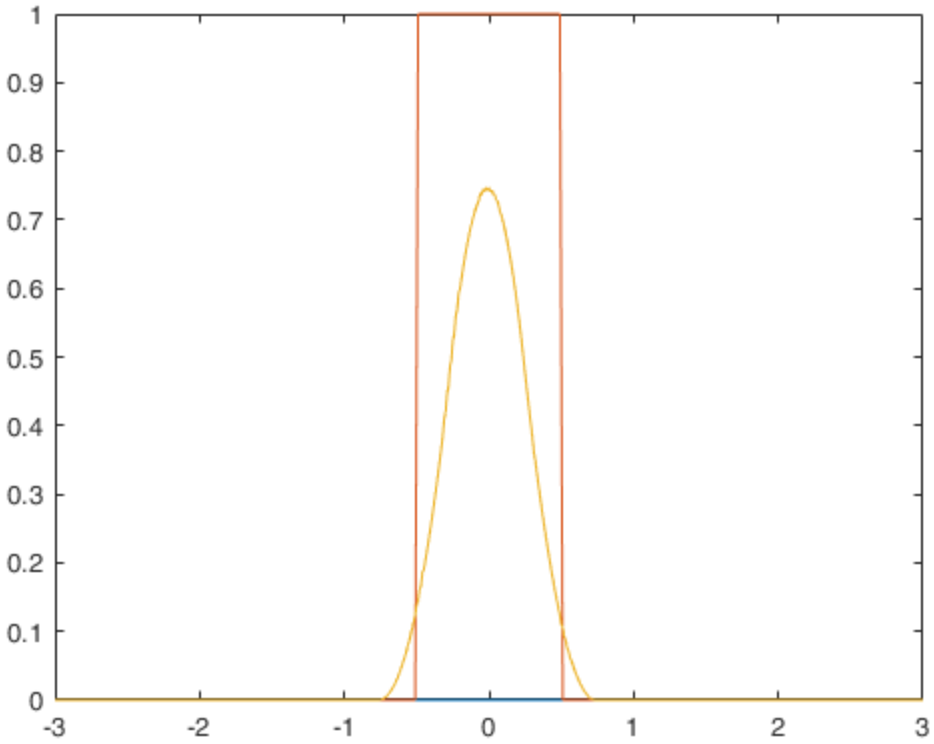
The goal of this lab is to gain a futher understanding of convolution and to use our knowledge of manipulating functions

```
figure(1)
axis tight manual
% Set up time array
DeltaT=.01
t=[-3:DeltaT:3];
% This script convolves an input signal, inputX with an
% impulse response ImpulseRes and makes a movie of the output signal
loops = length(t);
% Initialize the structure for the movie
F(loops) = struct('cdata',[],'colormap',[]);
width = 1;

outputX = zeros(size(t)); % Initialize signal
ImpulseRes = rectx(0, width,t); % Impulse Response

for jj = 1:loops
    center = min(t)+DeltaT*jj;
    inputX = rectx(center,width,t);
     % Here you can replace the input signal with many other things
 like
     % rects
    indNow=find(abs(t-center)<1.1e-2);
    % Convolve the signals by doing an integral approximation
    outputX(indNow) = sum(inputX.*ImpulseRes)*DeltaT;
    plot(t,inputX,t,ImpulseRes,t,outputX);
    F(jj) = getframe(1);
end

figure(2)
axis tight manual
DeltaT=.01
t=[-3:DeltaT:3];
loops = length(t);
F(loops) = struct('cdata',[],'colormap',[]);
width = 1;

outputX = zeros(size(t));
ImpulseRes = rectx(0, width,t);

for jj = 1:loops
    center = min(t)+DeltaT*jj;
    inputX = triangle(center,width,t);
    indNow=find(abs(t-center)<1.1e-2);
    outputX(indNow) = sum(inputX.*ImpulseRes)*DeltaT;
    plot(t,inputX,t,ImpulseRes,t,outputX);
    F(jj) = getframe(1);
```

```
end

figure(3)
axis tight manual
DeltaT=.01
t=[-3:DeltaT:3];
loops = length(t);
F(loops) = struct('cdata',[],'colormap',[]);
width = 1;
frequency = 2.1;

outputX = zeros(size(t));
ImpulseRes = rectx(0, width,t);

for jj = 1:loops
    center = min(t)+DeltaT*jj;
    inputX = user_cosine(center,frequency,t);
    indNow=find(abs(t-center)<1.1e-2);
    outputX(indNow) = sum(inputX.*ImpulseRes)*DeltaT;
    plot(t,inputX,t,ImpulseRes,t,outputX);
    F(jj) = getframe(1);
end

figure(4)
axis tight manual
DeltaT=.01
t=[-3:DeltaT:3];
loops = length(t);
F(loops) = struct('cdata',[],'colormap',[]);
width = 1;
frequency = 2;

outputX = zeros(size(t));
ImpulseRes = rectx(0, width,t);

for jj = 1:loops
    center = min(t)+DeltaT*jj;
    inputX = user_cosine(center,frequency,t);
    indNow=find(abs(t-center)<1.1e-2);
    outputX(indNow) = sum(inputX.*ImpulseRes)*DeltaT;
    plot(t,inputX,t,ImpulseRes,t,outputX);
    F(jj) = getframe(1);
end
% The convolution of a cosine with a rect having a frequency of
% 2 will result in a flat line because the entire area overlapped
% by the rect and cosine functions will contain positive and negative
% regions. As the sinusoid moves through, the total positive will
 equal
% the total negative and lead to a net of zero, resulting in a flat
 line.


DeltaT =
```

```
    0.0100

DeltaT =

    0.0100

DeltaT =

    0.0100

DeltaT =

    0.0100
```

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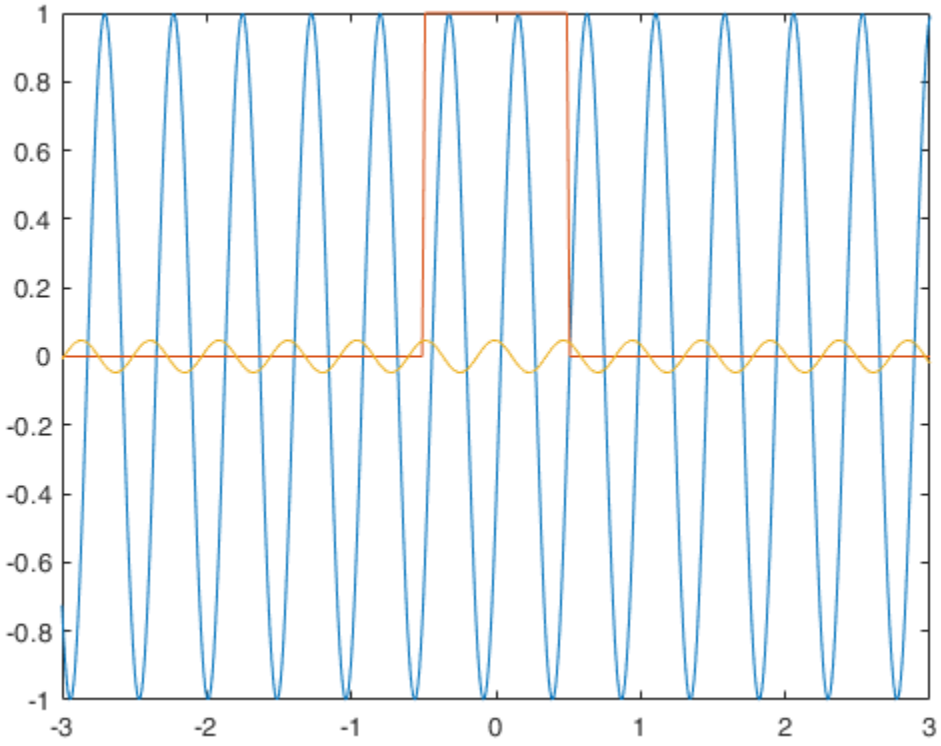
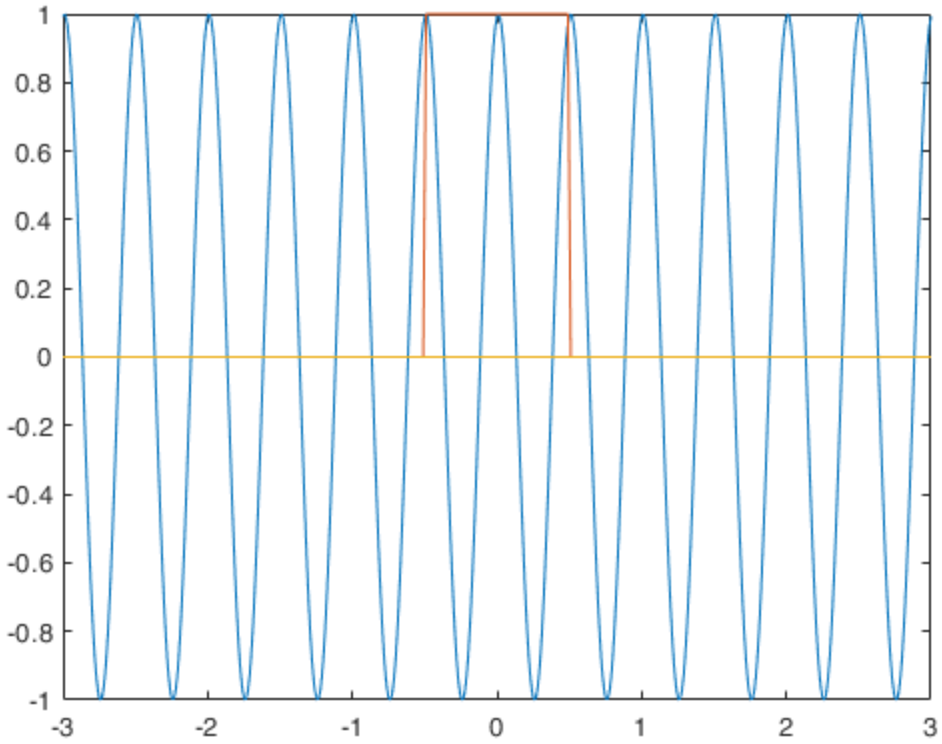
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-3
-2
-1
0
1
2
3


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-3
-2
-1
0
1
2
3



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