
Task 2 Javier Palomares

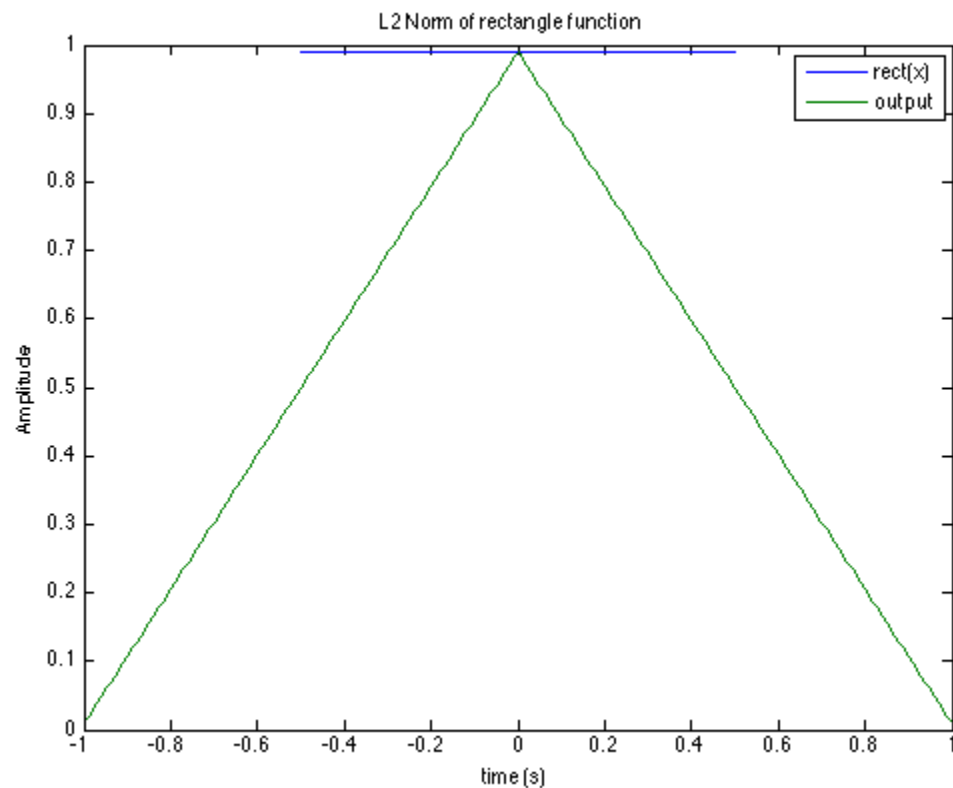
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EE102A javiepr@stanford.edu

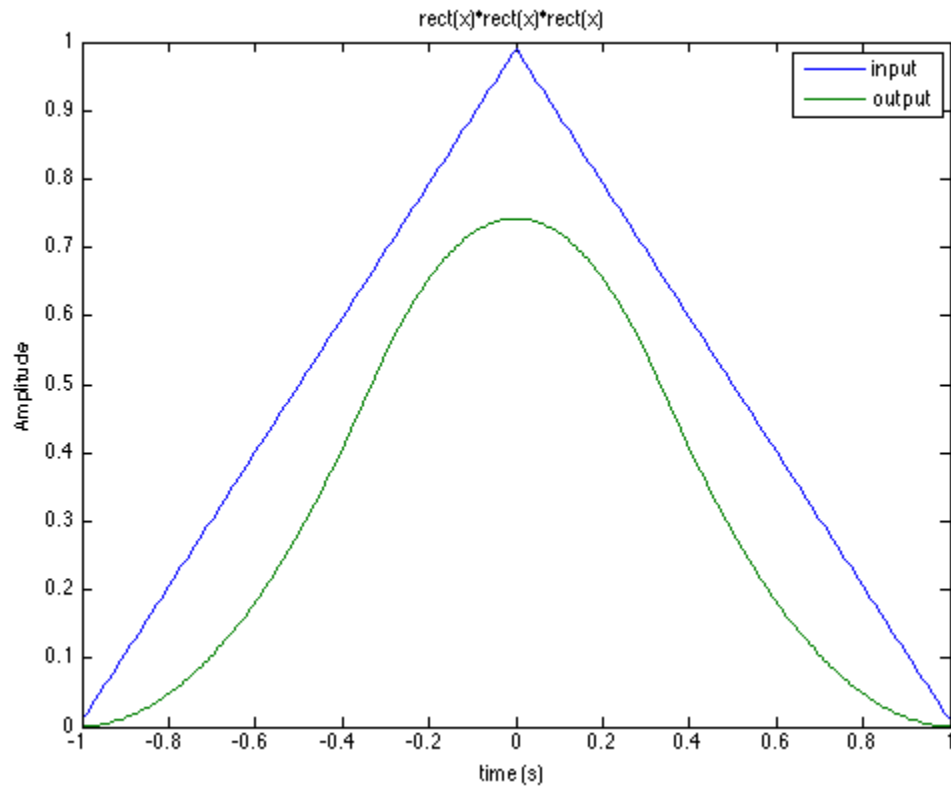
Part a

```
dt = .01;  
t = -.5:dt:.5;  
x = ones(1,101);  
% Normalize the input  
x = x / (sum(x) * dt);  
[y,ty] = nconv(x,t,x,t);  
plot(t,x,ty,y);  
legend('rect(x)', 'output');  
xlabel('time (s)');  
ylabel('Amplitude');  
title('L2 Norm of rectangle function');
```



Part b

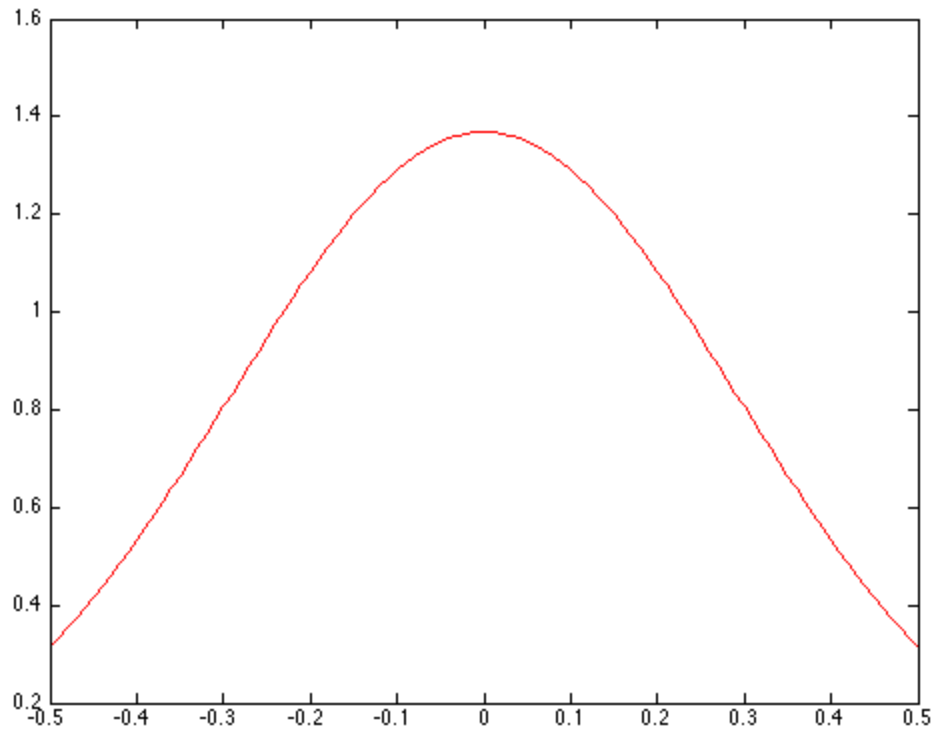
```
[y,ty] = nconv(x,t,x,t);
[Y,Ty] = nconv(y,t,x,t);
plot(ty,y,Ty,Y);
legend('input','output');
xlabel('time (s)');
ylabel('Amplitude');
title('rect(x)*rect(x)*rect(x)');
```

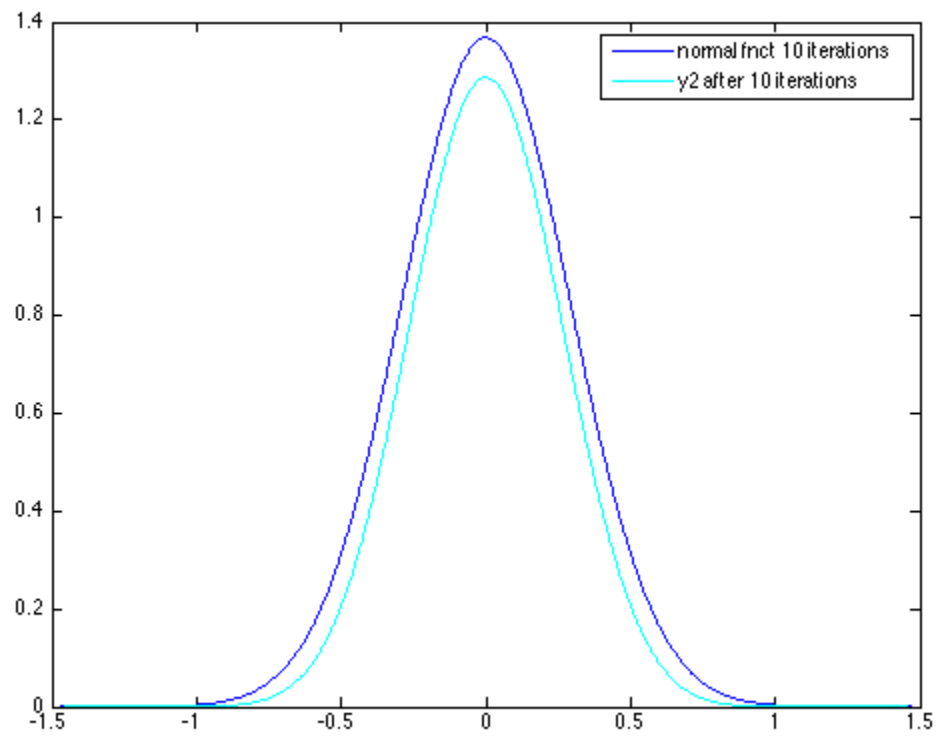
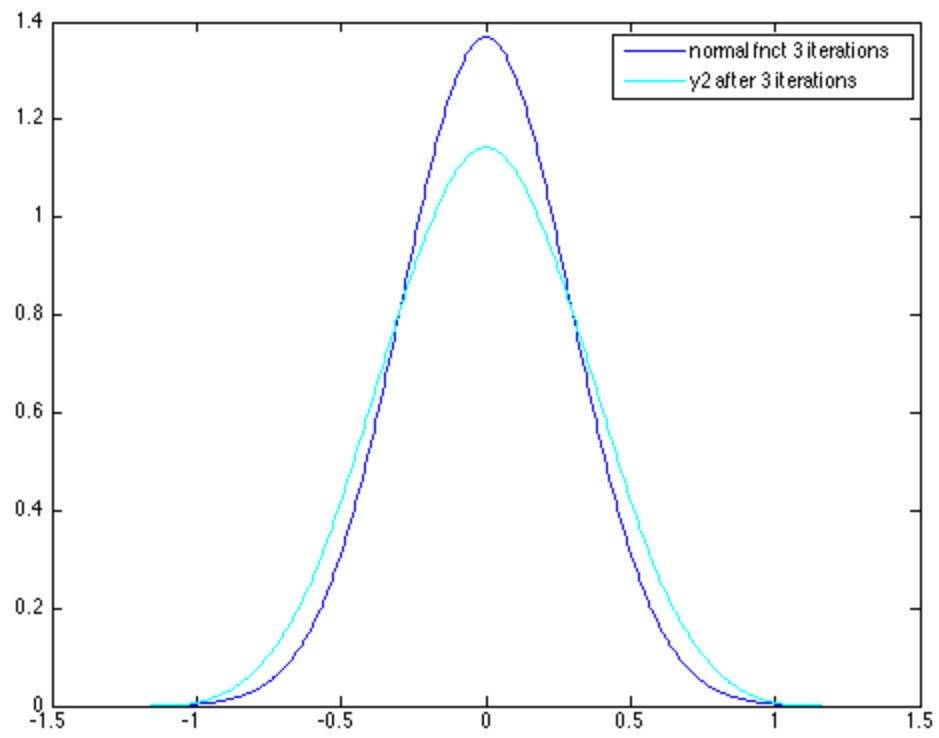


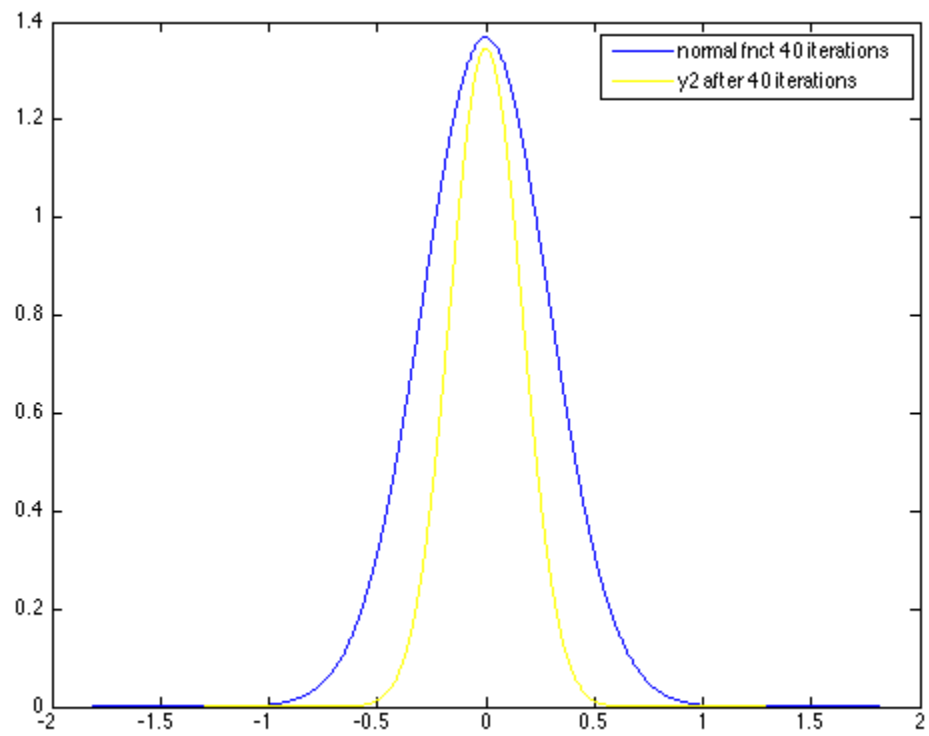
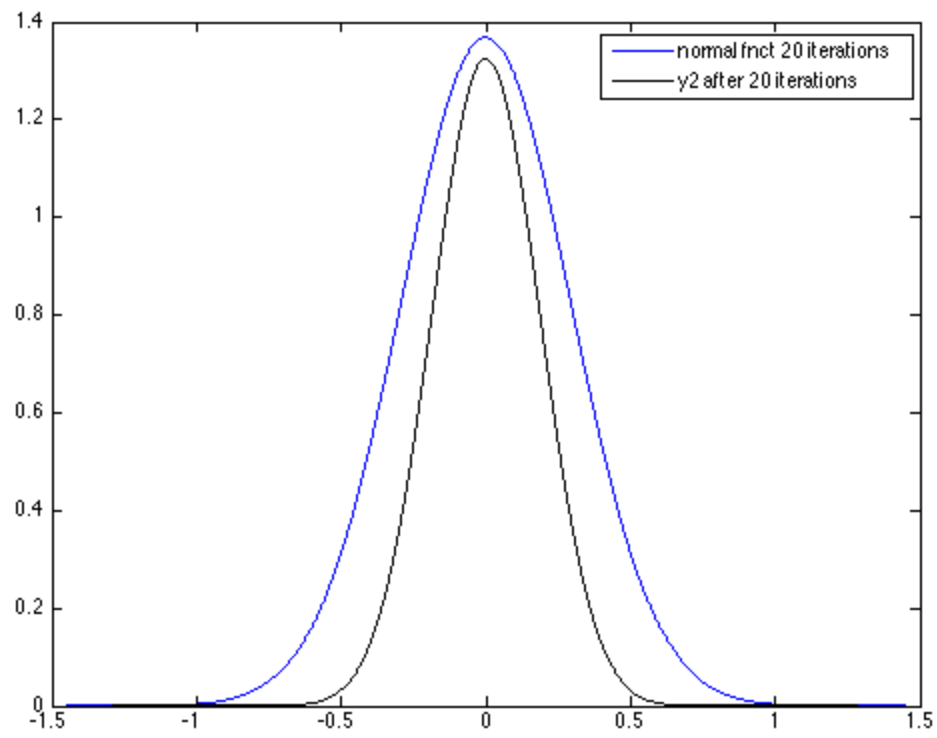
Part c

```
sigma = .2915;
y = x;
ty = t;
% Color string
cstring = 'rgbcmyk';
g = 1/(sqrt(2*pi)*sigma)*exp(-(ty.^2)/(2*sigma^2));
plot(t,g,'-r');
for i=1:40
    [y,ty] = nconv(y,ty,x,t);
    if(i == 3 || i == 10 || i == 20 || i == 40)
        y2 = sqrt(i) .* y;
        ty = ty / sqrt(i);
        g = 1/(sqrt(2*pi)*sigma)*exp(-(ty.^2)/(2*sigma^2));
```

```
figure();  
%plot(t,g);  
plot(ty,g,ty,y2,cstring(mod(i,7)+1) )  
legend(sprintf('normal fnct %d iterations',i),sprintf('y2 after %d iterati  
end  
end  
% As N increases, y2 is converging to a normal function
```



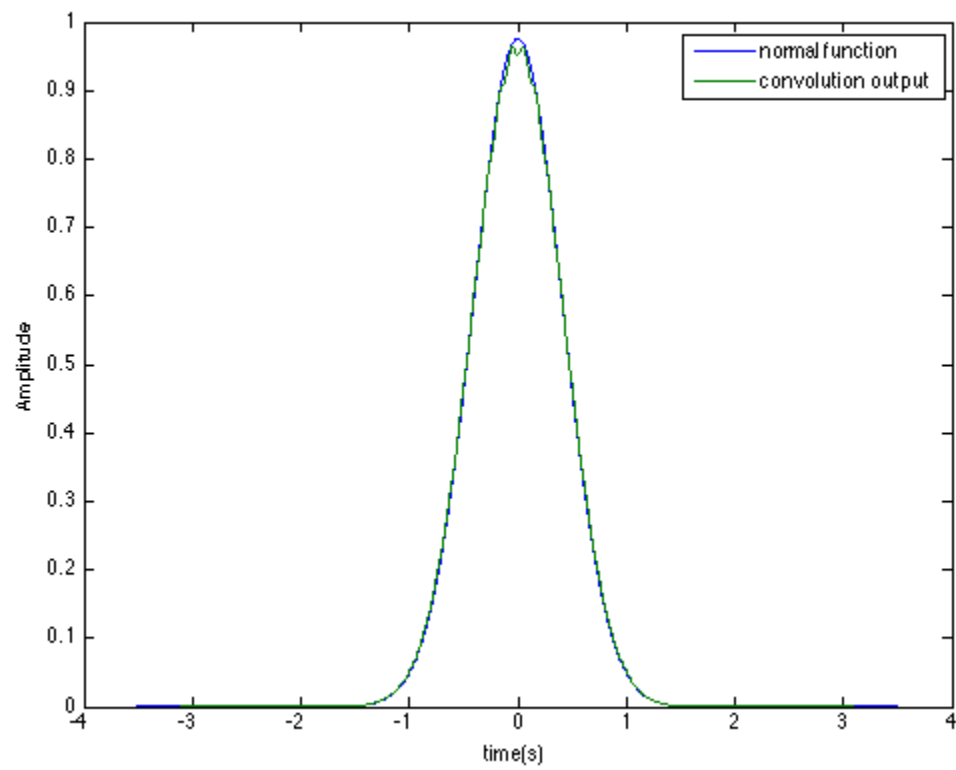
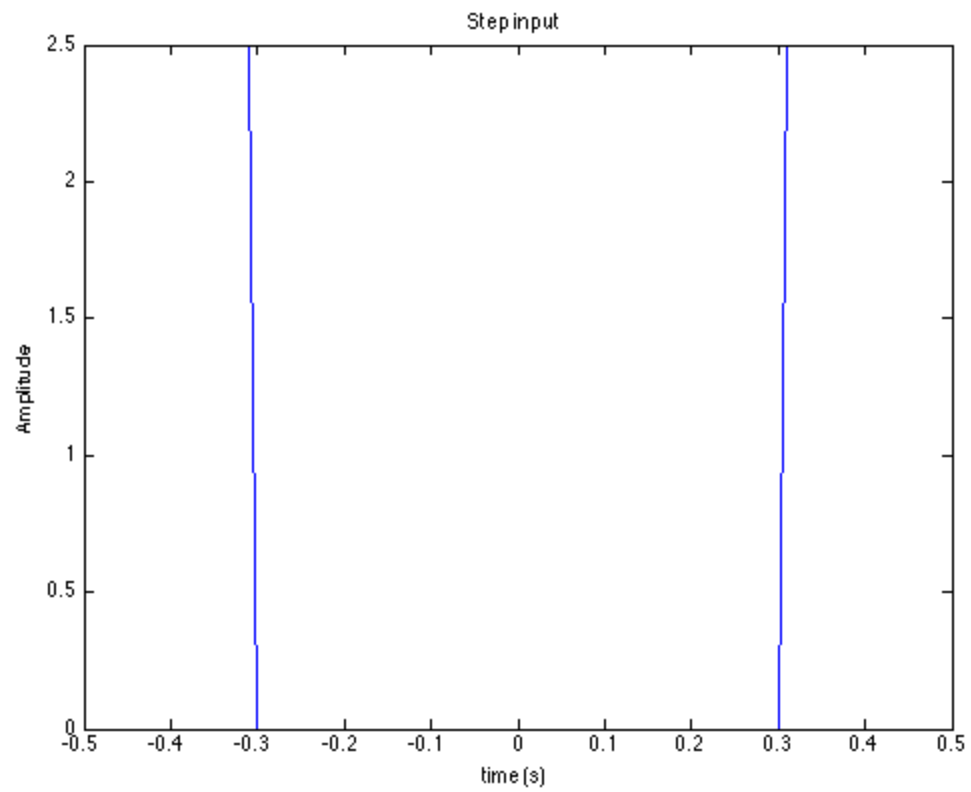




Part D

```
dt = .01;
t = -.5:dt:.5;
x = [ones(1,20) zeros(1,61) ones(1,20)];
x = x/(sum(x) * dt );
plot(t,x)
xlabel('time (s)');
ylabel('Amplitude');
title('Step input');
sigma = .4091;
minN = 0;
y = x;
ty = t;
g = 1/(sqrt(2*pi)*sigma)*exp(-(ty.^2)/(2*sigma^2));
for i=1:1000
    [y,ty] = nconv(y,ty,x,t);
    y2 = sqrt(i)* y;
    t2 = ty / sqrt(i);
    g = 1/(sqrt(2*pi)*sigma)*exp(-(t2.^2)/(2*sigma^2));
    if max(y2 - g) < .01
        minN = i;
        break
    end
end
figure();
plot(t2,g,t2,y2);
legend('normal function','convolution output');
xlabel('time(s)');
ylabel('Amplitude');

% y2 is also converging to a normal function
% Converges after 52 iterations
```



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