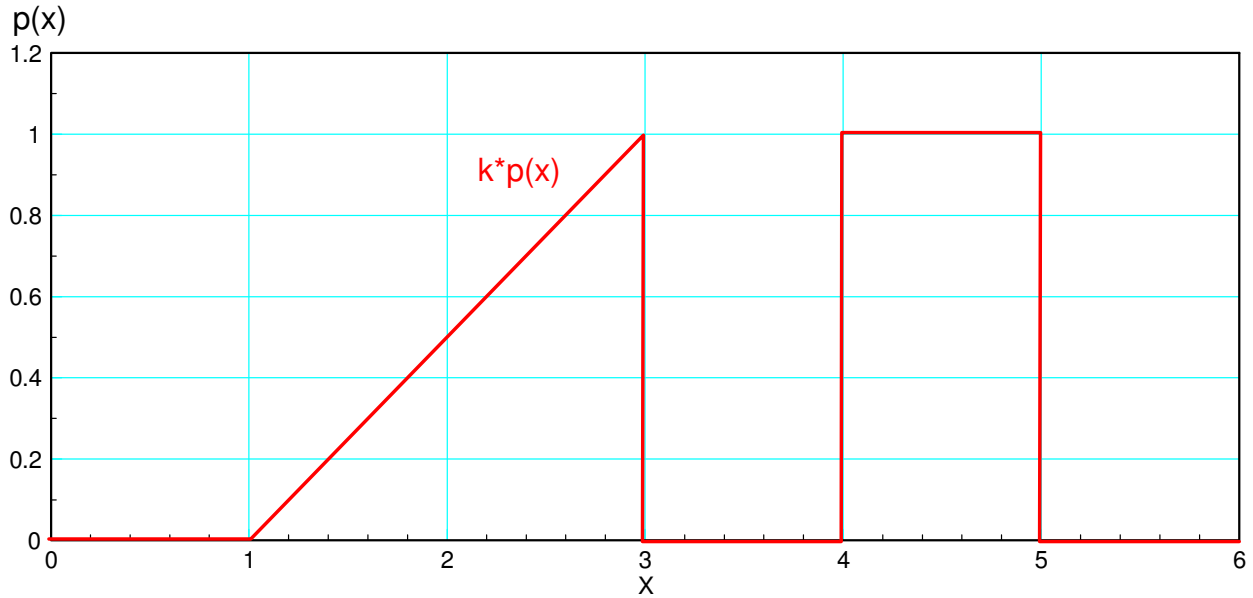


# ECE 341 - Homework #6

LaPlace Transforms, Continuous Probability Density Functions. Due Thursday, May 27th

Please make the subject "ECE 341 HW#5" if submitting homework electronically to Jacob\_Glower@yahoo.com (or on blackboard)

- 1) Determine the scalar so that the above function is a valid pdf (i.e. the total area is 1.000)



The area under the curve is currently 2

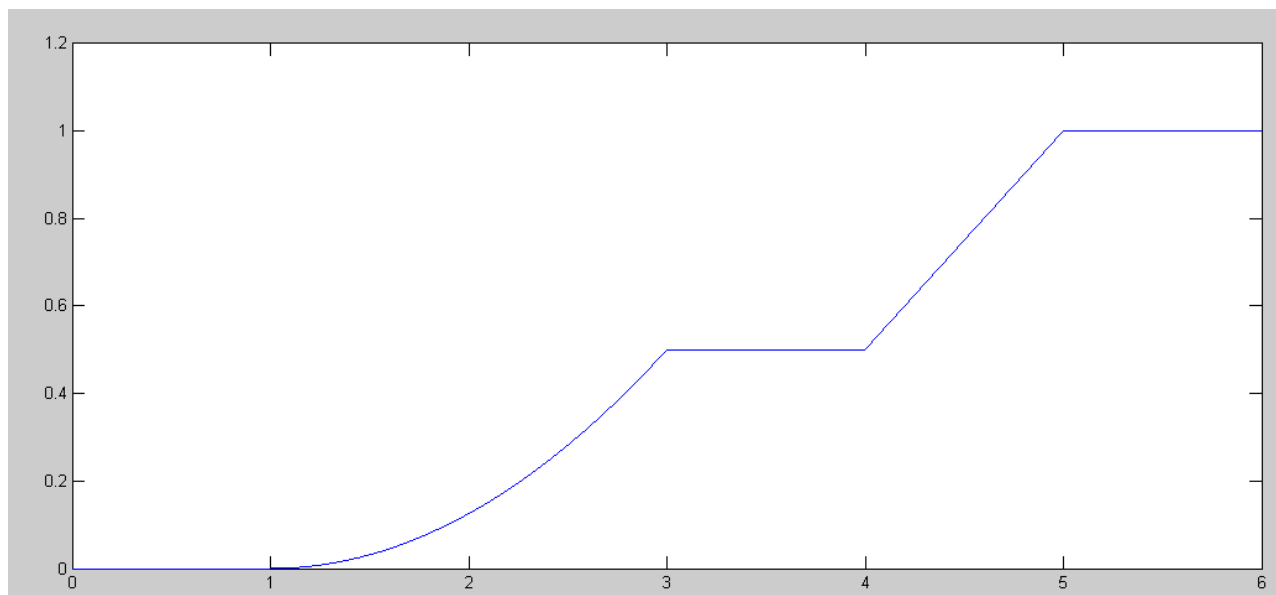
Multiply by  $1/2$  to make this a valid pdf

2) Determine the corresponding cdf (note: the integration constant in each region maintains continuity)

$$pdf = \begin{cases} 0 & t < 1 \\ 0.25(t-1) & 1 < t < 3 \\ 0 & 3 < t < 4 \\ 0.5 & 4 < t < 5 \\ 0 & 5 < t \end{cases}$$

$$cdf = \int pdf = \begin{cases} 0 & t < 1 \\ 0.125t^2 - 0.25t + 0.125 & 1 < t < 3 \\ 0.5 & 3 < t < 4 \\ 0.5t - 1.5 & 4 < t < 5 \\ 1 & 5 < t \end{cases}$$

```
>> t = [0:0.001:6]';  
>> cdf = (0.125*t.^2 - 0.25*t + 0.125) .* (t>1) .* (t<=3);  
>> cdf = cdf + 0.5 * (t>3) .* (t<= 4);  
>> cdf = cdf + (0.5*t - 1.5) .* (t>4) .* (t<=5);  
>> cdf = cdf + 1*(t>5);  
>> plot(t,cdf)  
>> ylim([0,1.2]);
```

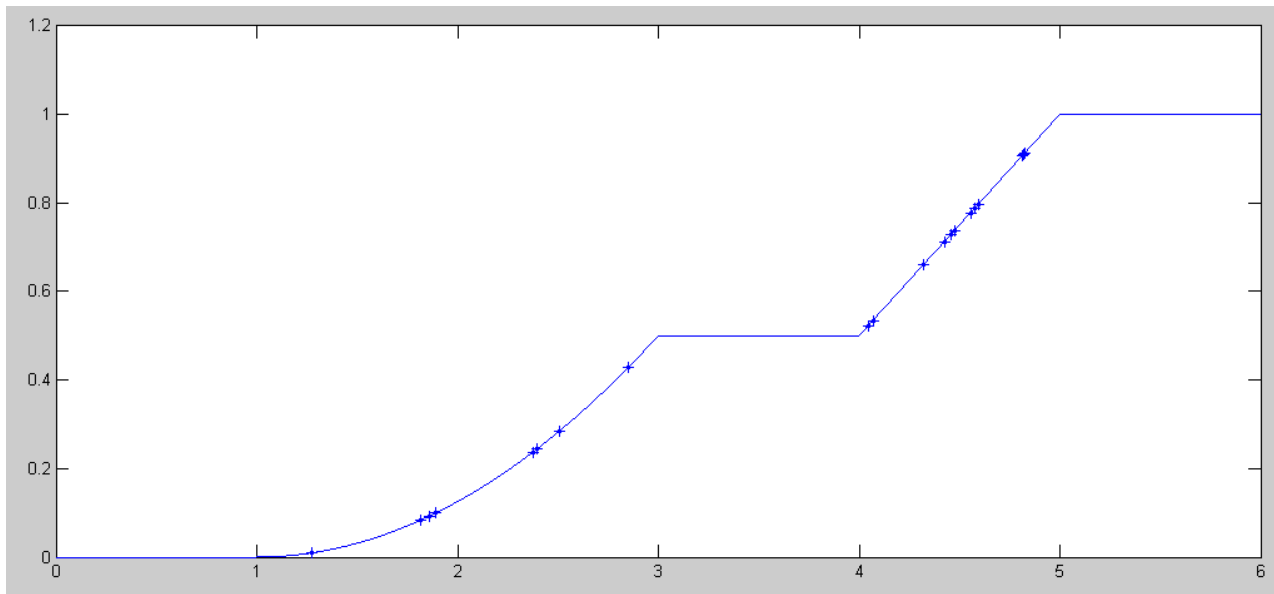


3) Using Matlab, find 20 random values of x for the above pdf

```
% t() and cdf(t) are from problem #2
p = rand(20,1);
x = zeros(20,1);
for i=1:20
    j=1;
    while(p(i) > cdf(j))
        j = j + 1;
    end
    x(i) = t(j);
end
>> [p,x]
```

p	x
0.7287	4.4580
0.9059	4.8120
0.0827	1.8140
0.2436	2.3970
0.7121	4.4250
0.2846	2.5090
0.9130	4.8270
0.0093	1.2740
0.2367	2.3770
0.4288	2.8530
0.7963	4.5930
0.0926	1.8610
0.5347	4.0700
0.7379	4.4760
0.7778	4.5560
0.9086	4.8180
0.5233	4.0470
0.6611	4.3230
0.7868	4.5740
0.0991	1.8910

```
>> hold on
>> plot(x,p,'b+');
>>
```



4) Find the moment generating function for  $p(x)$

$$p' = 0.25u(x-1)u(3-x) - 0.5\delta(x-3) + 0.5\delta(x-4) - 0.5\delta(x-5)$$

$$p'' = 0.25\delta(x-1) - 0.25\delta(x-3)$$

$$m(s) = \left(\frac{1}{s^2}\right)(0.25e^{-s} - 0.25e^{-3s}) + \left(\frac{1}{s}\right)(-0.5e^{-3s} + 0.5e^{-4s} - 0.5e^{-5s})$$

