ECE 341 - Test #2b

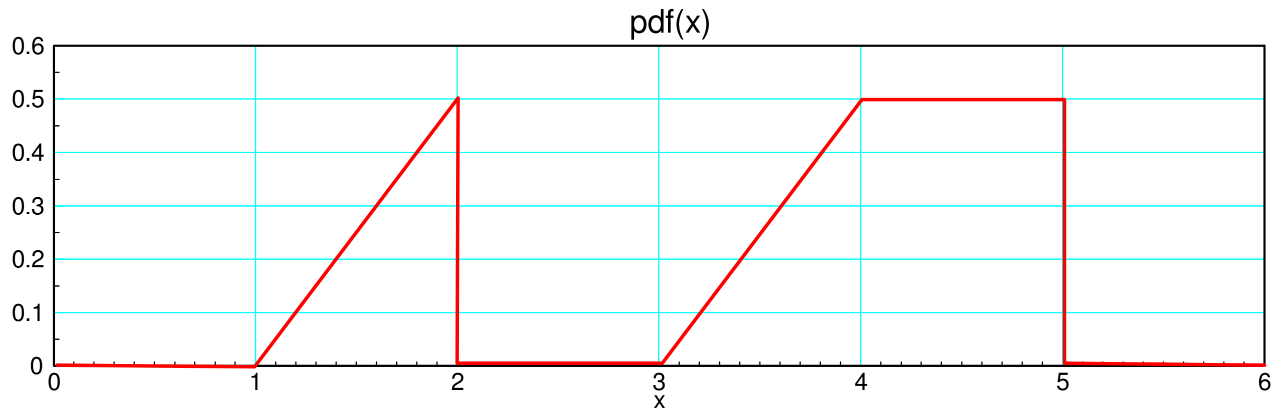
Continuous Probability

Open-Book, Open Notes. Calculators, Matlab, Tarot cards allowed. Just not other people.

1. Continuous PDF

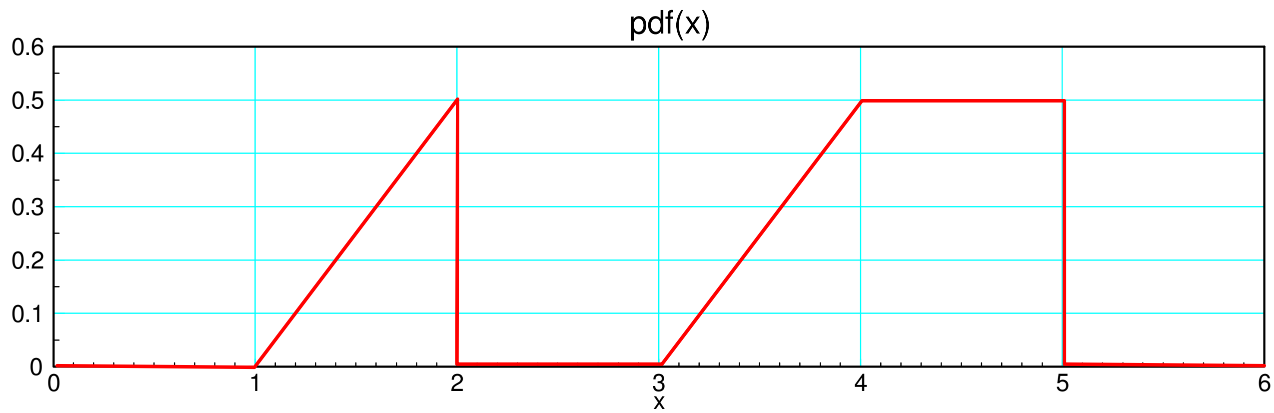
Test - Do Not Post

Determine the moment generating function (i.e. LaPlace transform) that corresponds to the following pdf.



2. Continuous CDF

Test - Do Not Post



a) Determine the cumulative density function (cdf) that corresponds to the above pdf.

b) In Matlab, generate 5 random numbers between 0 and 1 (rand function).

- Determine x that corresponds to each random number using the cdf.

3. Uniform Distribution

Test - Do Not Post

Let

- A be a uniform distribution over the range of (0, 4),
- B be a uniform distribution over the range of (0, 5), and
- C be a uniform distribution over the range of (0,6).
- Y be the sum: Y = A + B + C

a) Determine the pdf of Y

b) Determine the probability that Y > 13

4. Central Limit Theorem **Test - Do Not Post**

Let

- A be a uniform distribution over the range of (0, 4),
- B be a uniform distribution over the range of (0, 5), and
- C be a uniform distribution over the range of (0,6).
- Y be the sum: Y = A + B + C

a) Determine the mean and standard deviation of Y

b) Using a normal approximation, determine the probability that Y > 13

- note: For a uniform distribution over the range of (a,b)

$$\mu = \left(\frac{a+b}{2}\right), \qquad \sigma^2 = \frac{(b-a)^2}{12}, \qquad \sigma = \frac{b-a}{\sqrt{12}}$$

mean(Y)	std(Y)	p(Y < 13)

5. Testing with Normal Distributions

Test - Do Not Post

Assume each resistor has 5% tolerance:

$$R = (1 + 0.05x)R_0$$

where x is a uniform distribution over the range of (-1, 1). In Matlab

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R1 = 1000*(1+0.05*(rand*2-1));
R2 = 2000*(1+0.05*(rand*2-1));
R3 = 3000*(1+0.05*(rand*2-1));
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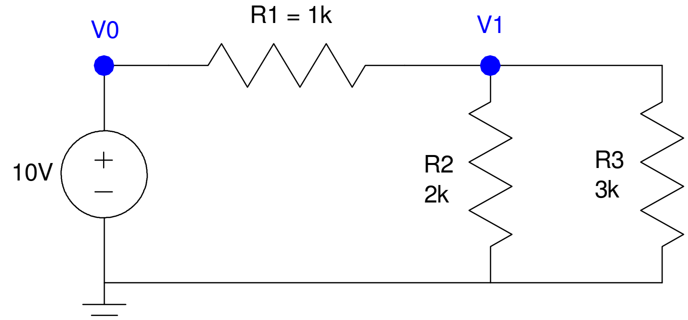

a) Determine V1 as a function of {R1, R2, R3}

b) Run a Monte Carlo simulation to solve for V1 with 100 random values for {R1, R2, R3}

c) Determine the mean and standard deviation of V1

d) Determine the 90% confidence interval for V1 using a normal approximation

mean(V1)	std(V1)	90% confidence interval for V1