ECE 341 - Test #2

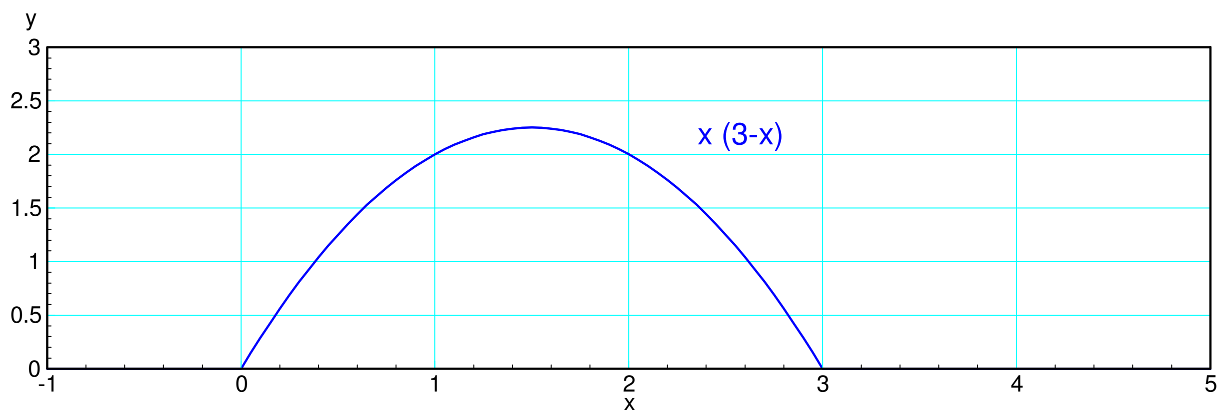
Continuous Probability

Open-Book, Open Notes. Calculators, Matlab, Tarot cards. Chegg and other people **not** allowed

1) Continuous PDF

Let

$$y = \begin{cases} \alpha \cdot x(3-x) & 0 < x < 3 \\ 0 & elsewhere \end{cases}$$



a) Determine the scalar, α, so that this is a valid pdf (i.e. the total area = 1.0000)

b) Determine the moment generating function (i.e. LaPlace transform)

2) Uniform Distribuitions

Let A, B, and C be continuous uniform distributions

- A = uniform over the interval of (0, 13)
- B = uniform over the interval of (0, m) where x is your birth month (1..12),
- X = A + B

Use moment generating functions to determine the pdf for X (i.e. LaPlace Transforms)

3) Exponential & Gamma PDF

Let A, B, and C be continuous exponential distributions:

- A has a mean of 13
- B has a mean of m (m is your birth month (1..12)), and
- C has a mean of d (d is your birth date (1..31))

(note: if you have a repeated root, add one to m or d)

Determine the pdf of Y = A + B + C using moment generating functions (LaPlace transforms)

4) Central Limit Theorem

Let A, B, and C be continuous uniform distributions

- A = uniform over the interval of (0, 5)
- B = uniform over the interval of (0, m) where m is your birth month (1..12),
- C = uniform over the interval of (0, d) where d is your birth date (1..31), and
- Y = A + B + C

a) Find the mean and standard deviation of Y

b) Use a normal approximation to Y to determine the

- z-score corresponding to Y=7 and
- The probability that Y > 7

5) Testing with Normal pdf

x is selected at random from population A or B. Assume A and B have normal distributions:

	mean	standard deviation
A (negative)	60	15
B (positive)	100	20

A threshold is used to classify x:

- If $x < 70$, it is assigned to population A
- If $x > 70$, it is assigned to population B.

a) What is the probability of a false positive?

- x is from population A but is assigned to population B

b) What is the probabilty of a false negative?

- x is from population B but is assigned to population A