# Recitation 8

ENEE324: Engineering Probability

Spring, 2018

The following problems are from the textbook.

**Problem 3.5.20.**
An absent-minded professor schedules two student appointments for the same time. The appointment durations are independent and exponentially distributed with mean thirty minutes. The first student arrives on time, but the second student arrives five minutes late. What is the expected value of the time between the arrival of the first student and the departure of the second student?

**Problem 3.5.21.**
We start with a stick of length $l$. We break it at a point which is chosen according to a uniform distribution and keep the piece, of length $Y$, that contains the left end of the stick. We then repeat the same process on the piece that we were left with, and let $X$ be the length of the remaining piece after breaking for the second time.

1. Find the joint PDF of $Y$ and $X$.
2. Find the marginal PDF of $X$.
3. Use the PDF of $X$ to evaluate $\mathbf{E}[X]$.
4. Evaluate $\mathbf{E}[X]$. by exploiting the relation $X = Y \times \frac{X}{Y}$

**Problem 3.5.23.**
Let the random variable $X$ and $Y$ have a joint PDF which is uniform over the triangle with vertices at (0,0), (0,1), and (1,0)

1. Find the joint PDF of $X$ and $Y$
2. Find the marginal PDF of $Y$
3. Find the conditional PDF of $X$ and $Y$
4. Find $\mathbf{E}[X|Y = y]$, and use the total expectation theorem to find $\mathbf{E}[X]$ in terms of $\mathbf{E}[Y]$.
5. Use the symmetry of the problem to find the value of $\mathbf{E}[X]$

**Problem 3.5.25.**
The coordinate $X$ and $Y$ of a point are independent zero mean normal random variables with common variance $\sigma^2$. Given that the point is at a distance of at least $c$ from the origin, find the conditional joint PDF of $X$ and $Y$.