

## Pre-class preparation

Please read the following textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition) OR watched the indicated video from Blitzstein's Math 110 YouTube channel:

- Textbook: 7.1 (Just part 7.1.2 and 7.1.3 on Continuous and Hybrid Variables)
- Video: Lecture 19: Joint, Conditional, and Marginal Distributions

## Objectives

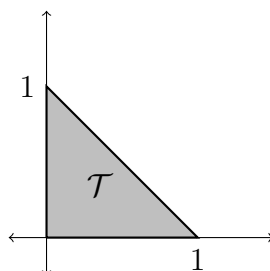
By the end of the day's class, students should be able to do the following:

- Calculate the joint PDF given marginal and conditional PDFs of continuous random variables, and vice versa.
- Interpret the values of the conditional PDF as statements about probabilities of events.
- Determine whether two or more continuous random variables are independent given either their joint PDF, or their marginal and conditional PDFs.
- Compute conditional probabilities for hybrid random vectors.

## Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 7:45AM:

1. Suppose  $X$  and  $Y$  are continuous random variables. In your own words, explain what the conditional density function  $f_{X|Y}(x|y)$  represents, and how it relates to conditional probabilities.
2. Why do you think the textbook author chooses to write  $P(Y = y)$  for the marginal distribution of  $Y$  when  $Y$  is discrete, and  $f_Y(y)$  for the marginal distribution when  $Y$  is continuous? (i.e. why would it be inappropriate to use  $P(Y = y)$  for both discrete and continuous marginal distributions?)
3. Let  $(X, Y)$  be a point selected uniformly at random in the triangle  $\mathcal{T} = \{(x, y) : 0 \leq x \leq y \leq 1\}$  (shown below):



Give an intuitive explanation for why the variables  $X$  and  $Y$  are not independent. Additionally, explain why the marginal distribution of each is not uniform. (You don't need to explicitly calculate the marginal distributions)

4. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?