

PROB 140 Spring 2021

WEEK 9 STUDY GUIDE



The Big Picture

More technique!

- We know how to find expectations of a function of a random variable. We now examine how to find the density of a function of another random variable that has a known density, and notice that we have to be careful when the function isn't monotone.
- An important transformation results in the process on which simulation of random variables is based
- To study the joint behavior of two random variables, we define their joint density, which is the analog of the discrete joint distribution. Probabilities and expectations are now double integrals.
- The family of *beta* densities is crucial for machine learning, and offers a good example of how joint densities are constructed.

Week At a Glance

Mon 3/17	Tue 3/18	Wed 3/19	Thu 3/20	Fri 3/21
	Instructor's Session		Instructor's Session	
		GSI's Sessions		
Checkpoint Week 9 (Due Wed 3/17)		Checkpoint Week 9 Due		
HW 7 Party 7PM HW 7 Due HW 8 (Due Mon 3/29)				
Lab 4B Due Lab 5A (Due Mon 3/29)				
Skim Sec 16.1	Read Sections 16.1-2	Read Ch 16, skim Sec 17.1 (just some of it)	Read Sec 17.1 carefully, skim Sections 17.2-3	Read Ch 17

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. A.	Live Sessions: GSIs	Recommended Practice
Ch 16	Densities of Transformations <ul style="list-style-type: none"> - 16.1 is about linear transformations; understanding this helps understand the non-linear case - 16.2 is about monotone transformations, linear or non-linear - 16.3 is for you to read: it's the process by which you can generate random variables with a specified distribution - 16.4 takes care of the non-monotone case, with particular reference to the square; in the typical semester, students read this one themselves too 	Tuesday 10/20 <ul style="list-style-type: none"> - A discussion of undefined expectation (8.1.3 and 15.3) - Densities of transformations Checkpoint is based on Chapter 16	 Wednesday 10/21 <ul style="list-style-type: none"> - Ch 16 Ex 3, 4, 5 	Ch 14 <ul style="list-style-type: none"> - All the exercises not covered in section. Be careful about signs in Ex 6. Ex 7 is a brain-teaser.
Ch 17	Joint Densities <ul style="list-style-type: none"> - 17.1-17.3 are the 2-dimensional counterparts of Ch 15 and the density version of Chapter 4. The examples in the videos aren't always the same as those in the text. - 17.4 is one of the "big name" families of densities 	Thursday 10/22 <ul style="list-style-type: none"> - Joint densities 	 Friday 10/23 <ul style="list-style-type: none"> - Ch 17 Ex 3, 4, 7 	Ch 15 <ul style="list-style-type: none"> - Ch 17 Ex 1, 6, 5, 9