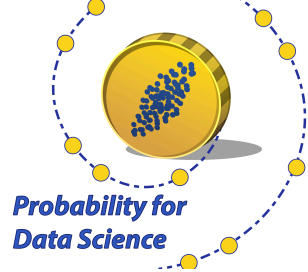


# DATA 140



Fall 2025

## 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 important for machine learning and offers a good example of how joint densities can be constructed.

### Week At a Glance

Mon 10/20	Tue 10/21	Wed 10/22	Thu 10/23	Fri 10/24
	Lecture	Sections	Lecture	Mega Sections
<b>Lab 6A Due</b> Lab 6B (Due 5PM Mon 10/27)			Lab 6B Party 9-12	
<b>HW 8 Due</b> HW 9 (Due 5PM Mon 10/27)				HW 9 Party 2PM to 5PM
Skim Sec 16.1	Work through Sections 16.1, 16.2, 16.4	Review Lab 6A Part 3, do Lab 6B Part 4, and work through Section 16.3	Work through Sec 17.1 carefully, skim Sections 17.2-3	Work through Chapter 17

## Reading, Practice, and Class Meetings

Book	Topic	Lectures: Profesor	Sections: TAs	Optional Additional Practice
Ch 16	<b>Densities of Transformations</b> <ul style="list-style-type: none"> <li>- 16.1 is about linear transformations; understanding this helps understand the non-linear case</li> <li>- 16.2 is about monotone transformations, linear or non-linear</li> <li>- 16.3 is <b>for you to read, referring to Parts 3 and 4 of Lab 4</b>: it's the process by which you can generate random variables with a specified distribution</li> <li>- 16.4 takes care of the non-monotone case, with particular reference to the square; in a typical semester, students <b>read this one</b> themselves too</li> </ul>	<b>Tuesday 10/21</b> <ul style="list-style-type: none"> <li>- Densities of transformations</li> </ul>	<b>Wednesday 10/22</b> <ul style="list-style-type: none"> <li>- Ch 16 Ex 1, 4, 6a</li> </ul>	<b>Ch 16</b> <ul style="list-style-type: none"> <li>- All the exercises not covered in section. Be careful about signs in Ex 6b.</li> <li>Ex 7 is a brain-teaser.</li> </ul>
Ch 17	<b>Joint Densities</b> <ul style="list-style-type: none"> <li>- 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.</li> <li>- 17.4 is one of the "big name" families of densities</li> </ul>	<b>Thursday 10/23</b> <ul style="list-style-type: none"> <li>- Joint densities</li> </ul>	<b>Friday 10/24</b> <ul style="list-style-type: none"> <li>- Ch 17 Ex 2, 4, 7</li> </ul>	<b>Ch 17</b> <ul style="list-style-type: none"> <li>- Ch 17 Ex 1, 9</li> </ul>