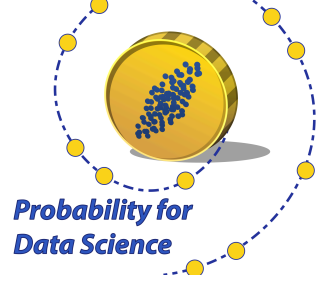


# DATA 140



Spring 2025

## WEEK 8 STUDY GUIDE

### The Big Picture

We move to random variables with a continuum of values.

- The normal is a continuous curve that acts as a probability distribution. We formally define the *density* of a random variable with a continuum of values, and extend the concepts of cdf and expectation to this situation.
- Along with the normal, we study two major distribution families: the uniform and the exponential.
- 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

### Week At a Glance

Mon 3/10	Tue 3/11	Wed 3/12	Thu 3/13	Fri 3/14
	Lecture	Sections	Lecture	Mega Sections
<b>Lab 5 due</b> Lab 6A (due Mon 3/17)			Lab 6A Party (9 AM - 12 PM)	
<b>HW 7 Due</b> HW 8 (Due Mon 3/17)				HW 8 party (2 PM to 5 PM)
Skim Section 15.1	Work through Sections 15.1, 15.3, 15.4	Skim Section 16.1	Work through Chapters 15 and 16	Work through Chapters 15 and 16

## Reading, Practice, and Class Meetings

Sections	Topic	Lectures: Michael	Sections: TAs	Optional Additional Practice
Ch 15	<p><b>Random Variables with Densities</b></p> <ul style="list-style-type: none"> <li>- 15.1-15.2 define a “continuous” probability histogram, and generalize the concept of density from Data 8 histograms</li> <li>- 15.3 covers expectation (including variance) and has examples including the uniform distribution family</li> <li>- 15.4 covers the exponential distribution family</li> <li>- 15.5 shows how to do calculus in SymPy, included in your lab</li> </ul>	<p>Tuesday 3/11</p> <p>Random variables on a continuum of values: extending all previous concepts to this case, and recognizing a benefit of the continuous world: single points don't affect probability calculations</p>	<p>Wednesday 3/12</p> <p>Ch 15: - Ex 1, 3, 5</p>	<p>Ch 15</p> <p>- 2, 9, 10, 11</p>
Ch 16	<p><b>Densities of Transformations</b></p> <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 6</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>	<p>Thursday 3/13</p> <p>- Densities of transformations</p>	<p>Friday 3/14</p> <p>Ch 16: - Ex 1, 4, 6a</p>	<p>Ch 16</p> <p>- All the exercises not covered in section. Be careful about signs in Ex 6b.</p> <p>Ex 7 is a brain-teaser.</p>