

# DATA 140



Spring 2026

## WEEK 11 STUDY GUIDE

### The Big Picture

The normal and gamma families are heavily used in modeling. We study these, along with a generating function that helps understand them better.

- The *moment generating function* (mgf) is more powerful than probability generating functions for dealing with sums. This helps us establish the properties of normal and gamma families that we observed by simulation, and indicates why the CLT is true.
- The mgf and *Chernoff's bound* improves on the tail bounds of Markov and Chebyshev.

### Week At a Glance

Mon 3/30	Tue 3/31	Wed 4/1	Thu 4/2	Fri 4/3
Regular OH 10AM - 3PM in Warren 101B	Lecture	Sections (turned into OH 9AM - 4PM in Evans 330)	Lecture	No Mega Sections
<b>Lab 6B Due</b> Lab 7A (Due 5PM Mon 4/6)			Lab 7A Party 3-5 PM in Warren 101B	
<b>HW 9 Due</b> HW 10 (Due 5PM Mon 4/6)				
Study for exam	Study for exam; skim 19.1, 19.2	Study for exam	<b>Midterm 2 8-10 PM good luck :)</b>	Work through Sections 21.1 and 21.2

## Reading, Practice, and Class Meetings

Book	Topic	Lectures: Prof. A.	Sections: TAs	Optional Additional Practice
Ch 19	<p><b>Introduction to Moment generating functions</b></p> <p>The first two sections of Ch 19 parallel the start of Ch 14 on the pgf</p> <ul style="list-style-type: none"> <li>- 19.1 has a formula for the density of a sum, but it's often intractable</li> <li>- 19.2-3 define the mgf and examine its uses</li> </ul>	<p><b>Tuesday 3/31</b></p> <ul style="list-style-type: none"> <li>- Convolution formula for the density of a sum</li> <li>- Moment generating functions: definition, main properties</li> </ul>	<p><b>Wednesday 4/1</b></p> <ul style="list-style-type: none"> <li>- Sections are converted into Office Hours for exam prep.</li> </ul>	<p><b>Ch 19</b></p> <ul style="list-style-type: none"> <li>- Ex 1, 7</li> </ul>
Ch 19	<p><b>Moment generating functions and Chernoff Bound</b></p> <ul style="list-style-type: none"> <li>- 19.3 develops a sort-of proof of the CLT</li> <li>- 19.4 uses the mgf to develop a new tail bound</li> </ul>	<p><b>Thursday 4/2</b></p> <ul style="list-style-type: none"> <li>- Moment generating functions: CLT; Chernoff's bound</li> </ul>	<p><b>Friday 4/3</b></p> <p>No mega sections</p>	