

I. **Pre-class material** Either read the indicated textbook sections OR watch the indicated video.

- (a) **Sections to Read** (All content from Blitzstein and Hwang's *Introduction to Probability* unless otherwise noted). A digital copy of the textbook is available for free via the authors' website.
- Sections 6.4 - 6.6
- (b) **Videos to Watch** (All videos from Blitzstein's Math 110 YouTube channel, unless otherwise noted)
- Lecture 17: Moment Generating Functions (from 17:00 to 37:00)
 - Lecture 18: MGFs continued (from beginning to 27:00)

II. **Objectives** (By the end of the day's class, students should be able to do the following:)

- State the definition of the moment generating function for a random variable.
- Compute the moment generating function for a variety of common discrete and continuous distributions.
- Identify a random variable by recognizing its moment generating function.
- Use location-scale properties of the moment generating function to find the MGF of a transformation of a variable.
- Use the moment generating function to compute the moments of a random variable.
- Compute the moment generating function for a sum of independent random variables.
- Obtain the moments of a random variable by manipulating the moment generating function of a related variable.

III. **Reflection Questions** (Submit answers on Gradescope <https://www.gradescope.com/courses/425901>)

- 1) True or false? If X is a constant random variable (i.e. $P(X = c) = 1$ for some c), then the MGF of X is also a constant function.
- 2) Explain why the domain of the 'moment generating function' for any random variable always contains at least 1 point. Then discuss why the value of the moment generating function at this point doesn't give any useful information about the random variable.
- 3) Suppose the moment generating function for a random variable X is

$$M(t) = \sum_{k=0}^{\infty} \frac{2^k}{k!} t^k$$

Using the power series representation of M , find $E[X]$ and $E[X^2]$ without doing any integration.

IV. **Additional Feedback** Are there any topics you would like further clarification about? Do you have any additional questions based on the readings / videos? *If not, you may leave this section blank.*