Pre-class preparation

Please read the following textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition) OR watched the indicated video from Blitzstein's Math 110 YouTube channel:

- Textbook: Sections 6.5-6.6
- Video: Lecture 18: MGFs continued (from 4:30 to 27:00)

Objectives

By the end of the day's class, students should be able to do the following:

- 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.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 7:45AM:

1. 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 $\mathbb{E}[X]$ and $\mathbb{E}[X^2]$ without doing any integration.

2. Suppose we have m Binomial random variables which are all independent of each other: $X_1 \sim \text{Binom}(n_1, p)$, $X_2 \sim \text{Binom}(n_2, p)$, ..., $X_m \sim \text{Binom}(n_m, p)$. Using MGFS, what is the distribution of the random variable $\sum_{i=1}^{m} X_i$?

3. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?