Pre-class preparation

Optional: Parts of the new material for this class will build on Taylor series. If you would like a quick refresher on power series and Taylor series, please either review your notes from Calc II or watch this video here (apologies for the slightly blurry screen share!):

- Video: Zoom recording.

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: Section 6.4

- Video:

    - Lecture 17: Moment Generating Functions (from 17:00 to 37:00)
    - Lecture 18: MGFs continued (from beginning to 4:30)

Objectives

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

- State the general definition of a power series.

- Express derivatives and integrals of power series as power series.

- State the definition of the Taylor Series for a function centered at a given value.

- Find the Taylor Series representations for several common functions

- 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 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.

Reflection Questions

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

1. Suppose $f(x)$ is the following power series:

$$f(x) = \sum_{k=1}^{\infty} k x^k$$

   Find a power series formula for $f'(x)$.

2. 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.

3. Explain why the domain of the MGF for any random variable always contains at least 1 point. Then discuss why the value of the MGF at this point doesn't give any useful information about the random variable.

4. (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?