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 5.5, 5.6
- Video:
  - Lecture 16: Exponential Distribution
  - Lecture 17: Moment Generating Functions (from beginning to 17:00)

Objectives

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

- Give the PDF, CDF and a story description for an Exponential distribution.
- Show that the PDF for an exponential random variable is valid, and compute the mean and variance for the exponential variable.
- Prove that the exponential variable is the only continuous variable with the memoryless property.
- Describe the relationship between the exponential and Poisson variable in the context of the Poisson process.

Reflection Questions

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

1. Suppose $X \sim \text{Exp}(\lambda)$. Is X symmetric around 0? Is there any value $c > 0$ so that X is symmetric around that value? (i.e. so that X has the same distribution as $c - X$)
2. Wait times until objects fail are often represented using exponential variables. Suppose the time T from purchase until a harddrive fails is exponentially distributed with rate $\lambda = \frac{1}{6}$. If you have owned the computer for 1 year already, what is the expected amount of time you will need to wait from now until the harddrive fails? (You should be able to answer without calculating any integrals).
3. Consider two random variables X and Y, and let $L = \min\{X, Y\}$. Suppose t is a fixed real number.
   (a) Explain why the event "$L > t$" is the same as the event "$X > t, Y > t$".

(b) Is it true that the event "$L \leq t$" is the same as the event "$X \leq t, Y \leq t$"? Explain.

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?