Pre-class preparation

Please watch the following video OR read the following section textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition):

- Video: Beta and Gamma

- Textbook: Sections 8.3 (everything before Story 8.3.2), 8.4 (stop after pictures of PDFs on pg. 389)

Objectives

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

- State the PDF for the beta distribution with parameters a and b, and describe the shape of the distribution for various values of these parameters.

- State the integral definition of the gamma function.

- State the PDF for the Gamma distribution with parameters a and b.

- Compute the mean of the Gamma and Beta distributions by pattern recognition of PDFs.

- Describe the relation between the Beta and Gamma distributions, and the Gamma and Exponential distributions.

Reflection Questions

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

1. Suppose a and b are positive real numbers. Use properties of the Gamma function to show the following (without doing ANY integrals):

$$\frac{\Gamma(a+b+2)}{\Gamma(a+1)\Gamma(b+1)} \cdot \frac{\Gamma(a)\Gamma(b)}{\Gamma(a+b)} = \frac{(a+b+1)(a+b)}{ab}$$

   Do not assume that a and b are integers.

2. Suppose you are given the following integral:

$$\int_0^\infty x^2 e^{-2x} dx$$

   What constant would you multiply the integral by to have this integral evaluate to 1, and why?

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?