Pre-class preparation

Please read the following textbook sections from Degroot and Schervish's *Probability and Statistics* (fourth edition) or watch the video, as indicated:

- Textbook: 7.2

Objectives

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

- State the definition of the prior distribution of a parameter and interpret it from a Bayesian perspective.
- State the definition of the posterior distribution of a parameter and interpret it from a Bayesian perspective. Explain how a posterior distribution relates to a prior distribution.
- Define the likelihood function and state in plain language what it represents.
- Evaluate the likelihood function for a given statistical model.
- Understand how to compute the posterior distribution using the prior distribution and likelihood function.
- Use `R` to calculate the normalizing constant in the posterior distribution.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 8:45AM:

1. Suppose two people plan to flip a coin with an unknown probability θ of landing heads. The first suggests a discrete uniform distribution on the two values $\{0, 1\}$, while the second suggests a continuous uniform distribution on the interval $[0, 1]$ (i.e. $\theta \sim \text{DiscreteUnif}\{0, 1\}$ versus $\theta \sim \text{Unif}[0, 1]$). Explain, in non-technical language, what each choice of prior distribution represents about the individual's beliefs about the coin.
2. After Definition 7.2.3, the textbook states "the posterior p.d.f. of θ is proportional to the product of the likelihood function and the prior p.d.f. of θ". Explain in your own words what the notion of "is proportional to" means here.
3. Suppose I have data X_1 and X_2 that are distributed $\text{Binom}(m, \theta)$, where the number of trials m of each Binomial is constant. What is the likelihood function for θ? (If you need to make some assumptions, be sure to state them).
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?