A. Problems to Submit

To receive full credit, you must provide detailed written solutions for each of these problems.

1. BE (Bain and Engelhardt) Exercises: 7.1, 7.18
2. BE Exercises: 7.2, 7.19, 7.3
3. Consider **Example 7.2.2** in the textbook, on pages 233.
   Let $X_1, X_2, \ldots, X_n$ be a random sample from an exponential distribution, $X_i \sim \text{EXP}(\theta)$ and let $Y_n = X_{1:n}$ be the smallest order statistic.
   (a) Using the definition of a CDF (**Theorem 2.2.3**), show that $G_n(y)$ is a proper CDF. That is, show that the conditions (2.2.8–2.2.11) hold for $G_n(y)$.
   (b) Sketch the graph of the limiting function $G(y)$.
   (c) Explain why the authors state that $G(y)$ being discontinuous (and not even right-continuous) at $y = 0$ "is not a problem". How does this connect with our explanations in the **lecture notes** on pages 1–2?
4. (**Example 7.2.6** in the textbook, on page 235)
   Consider $X_1, \ldots, X_n$ a random sample where $X_i \sim \text{EXP}(\theta)$. Define the random sequence $Y_n = (1/\theta)X_{n:n} - \ln(n)$. The purpose of this exercise is to demonstrate that Y_n converges in distribution
   (a) Prove that the CDF of Y_n is $G_n(y) = \left[1 - \frac{1}{n}\exp(-y)\right]^n$, when $y > -\ln(n)$ and zero otherwise.
   (b) Show that $\lim_{n\to\infty} G_n(y) = G(y)$, with $G(y) = \exp(-\exp(-y))$, where $-\infty < y < \infty$.
   (c) Show that $G(y)$ is a CDF.
5. BE Exercise 7.5