PSETs Landing Page*

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This is the documentation for using my PSET PDFs responsibly. I post these LaTEX'd PSETs (1) as an education resource for friends at other universities, fellow Yalies, and all those interested and (2) for quick reference. These PSETs are not to be used irresponsibly; only look at the solution after giving each problem an honest attempt. **If YOU USE THESE PSETS TO CHEAT, YOU ARE NOT ONLY STUPID BUT YOU ARE CHEATING YOURSELF OUT OF THE ABILITY TO FALL IN LOVE WITH MATH.** Furthermore, I am not smarter than you and my solutions did not always get a perfect score.

The general format for accessing the (one-indexed) `N`th assigned PSET PDF of a Yale course with course number `CODE` is:

`https://anish.lakkapragada.com/notes/TYPE-CODE/psets/N.pdf`

where `TYPE` is `stats` or `math`. Similarily, to access my solution for this PSET you can go to:

`https://anish.lakkapragada.com/notes/TYPE-CODE/sols/N.pdf`

These PSETs and associated solution PDFs are synchronized daily at 4:20AM with my computer files through a Cronjob Shell Script. If you want to contribute any corrections, please email `anish.lakkapragada@yale.edu`.

*Note that PDF here is referring to Portable Document Format, not to be confused with the veritable Probability Density Function.

S&DS 241/541
Problem Set 8
due Nov. 6, 2024, 11:00 pm via Gradescope

Guidelines

- Please write legibly and explain your reasoning. For full credit, your answer and your reasoning need to be not only correct, but clear to the grader.
- Late problem sets will not be accepted unless there are extenuating circumstances (e.g., an illness or family emergency). Undergraduates must obtain a Dean's excuse for any late submission. Graduate students must obtain permission before the deadline. (As mentioned in the syllabus, we'll drop your lowest homework score.)
- You're encouraged to discuss the homework with classmates (this can be a good way to learn), but you must write your solutions independently and in your own words.

Problems

1. Chapter 5, Exercise 37. Hint: For part (c), you can apply the result from Example 5.6.3 (Minimum of independent Expos).
2. Chapter 6, Exercise 15. Hint: For part (b), the "famous distribution" is one of those whose MGFs are shown in section 6.4.
3. Chapter 6, Exercise 18. Note: You don't need to rederive the MGF of the Geometric distribution. You can use the formula from Example 6.4.3.
4. Chapter 6, Exercise 24.
5. Use moment generating functions to answer these questions:
   (a) Suppose X_1 and X_2 are independent random variables, $X_1 \sim \text{Binomial}(n_1, p)$, and $X_2 \sim \text{Binomial}(n_2, p)$. Does $X_1 + X_2$ follow a Binomial distribution? If so, what are the parameters?
   (b) Suppose Y_1 and Y_2 are independent random variables, $Y_1 \sim \text{Exponential}(\lambda_1)$, and $Y_2 \sim \text{Exponential}(\lambda_2)$. Does $Y_1 + Y_2$ follow an Exponential distribution? If so, what's the parameter?
6. (Not graded) On a separate page, please write your name and acknowledge anyone who helped you or discussed the problem set with you (other than the instructor, TFs, and ULAs), as well as any written resources you consulted (other than the textbook and other resources on Canvas). If you don't have any acknowledgments to make, please write "I worked independently."