

Assignment 4

*Due date: Oct. 9, 11 p.m.**Instructor: Daniel McDonald and Benjamin Bloem-Reddy*

Instructions

Academic integrity policy: I encourage you to discuss verbally with other students about the assignment. However, you **must** write your answers by yourself. If you discuss the assignment with anyone (a classmate or anyone else), you must say so at the top of your solutions. Use of AI tools to produce full or partial answers to these questions or to related questions is strictly prohibited. This includes tools like Co-pilot, auto-complete, etc. Also, refrain from looking at answer keys from other schools, previous years, or the Math Stack Exchange. For more information, see: the syllabus or contact the instructor.

1. Solutions may be handwritten or typeset with L^AT_EX (see the course website for a template). It must be legible. Difficult-to-read solutions will be marked down or ignored.
2. *Justify your answers formally. (Err on the side of too much detail so that the teaching team knows exactly what you're doing and why.)*
3. Submit your work by 11:59 pm (Vancouver time) on the due date to Canvas (.pdf).
4. For questions that require computer simulations, you may use any language from the list of (R, Julia, Python), with level of support provided by the teaching team decreasing further in the list. Please include in your PDF submission the relevant plots generated by your simulation code, and append your code (in PDF) to your submission. Please retain the code you used, as you may be asked for it if required.

Questions

1. [Wasserman \(2006\)](#) 2.8. (Same as [Wasserman 2004](#), 7.6 on assignment 3.)
2. [Wasserman \(2006\)](#) 2.10. (Note that this should state that $\theta = T(F) = F^{-1}(p)$ is the p -th quantile of F .)
3. [Wasserman \(2006\)](#) 3.9. Assume that $X_1, \dots, X_n$ are i.i.d. with mean μ and variance σ^2 .
4. [Wasserman \(2006\)](#) 3.9. By “parametric bootstrap”, we mean that you should assume that the data are distributed according to the model, but with μ unknown. So given the data, you should estimate μ by $\hat{\mu} = \bar{X}$, and then generate samples from the distribution $N(\hat{\mu}, 1)$. This is in contrast to the “nonparametric bootstrap” where you would just sample with replacement from the original data. Use $B = 10000$ bootstrap samples. And use the Pivotal interval the bootstrap.
5. [Wasserman \(2006\)](#) 3.11(b). Feel free to use (a) as practice, but you do not need to submit it.

References

Larry Wasserman. *All of Statistics*. Springer, New York, 2004.

Larry Wasserman. *All of Nonparametric Statistics*. Springer, New York, 2006.