

## STAT 150 HOMEWORK #1

SPRING 2022

**Due Friday, February 4th, at 11:59 PM on Gradescope.**

Note that there are *Exercises* and *Problems* in the textbook. Make sure you read the homework carefully to find the assigned question.

1. Pinsky and Karlin, Problem 1.3.11
2. Pinsky and Karlin, Problem 1.4.3
3. Pinsky and Karlin, Problem 1.5.7
4. Pinsky and Karlin, Problem 1.5.8
5. Pinsky and Karlin, Problem 2.1.2
6. Pinsky and Karlin, Problem 2.1.9
7. Pinsky and Karlin, Problem 2.3.5
8. Let  $X$  be a random variable. Recall that the moment generating function (or MGF for short)  $M_X(t)$  of  $X$  is the function  $M_X : \mathbb{R} \rightarrow [0, \infty]$  defined by  $t \mapsto \mathbb{E}[e^{tX}]$ . Now suppose that  $X \sim \text{Gamma}(\alpha, \lambda)$ , where  $\alpha, \lambda > 0$ . Prove that

$$M_X(t) = \begin{cases} \left(\frac{\lambda}{\lambda - t}\right)^\alpha & \text{if } t < \lambda; \\ \infty & \text{if } t \geq \lambda. \end{cases}$$