MA204: Mathematical Statistics
Assignment 2

Part I (Weights 4%):

Submit your solutions to Q2.1 ~ Q2.6 on pages 99—100 of Lecture Notes <<Mathematical Statistics>>, plus the following two questions

2.7 Let X_1, X_2 be a random sample from the $N(0,\sigma^2)$ population.
(a) Derive the distribution of the statistic

$$\frac{(X_1-X_2)^2}{(X_1+X_2)^2}$$

(b) Find the constant k, such that

$$\Pr\left\{\frac{(X_1+X_2)^2}{(X_1+X_2)^2+(X_1-X_2)^2}>k\right\}=0.1.$$

[Hint: Pr{ $F(1, 1) < 0.02508563$}=0.1, where $F(1, 1)$ denotes F random variable with 1 and 1 degrees of freedom]

2.8 Show that if X and Y are independent exponential random variables with $\lambda=1$, then X/Y follows an F distribution. Also, identify the degrees of freedom.

Part II (Weights 1%):

Please find one question (denoted by Q2.9) from any textbooks of mathematical statistics (in English) satisfying the following conditions

1. **The content of your Q2.9 must belong to Chapter 2 of Lecture Notes <<Mathematical Statistics>>.**
2. **请标明你的 Q2.9 是来自哪一本书的哪一页，for example:**

Miller, I. and Miller, M. (2004). John E. Freund's Mathematical Statistics with Applications (7-th Edition). Prentice-Hall, New Jersey, Pages 6-7.

3. **你可以从任何中文的数理统计书中找一个题目及答案，但要翻译成为英文.**
4. **你的 Q2.9 既要不同于本教科书中的任何 Examples, Exercises, 也要不同于 Tutorial 中的任何 Examples 以及本课 QQ 群中所给的 100 Problems.**
5. **Please submit the question Q2.9 itself with your solution.**
6. **鼓励用 Word 或 Latex 编辑**
7. **Q2.9 and its solution (for all students in Class I and Class II) should be submitted to 徐彬同学.**