

臺灣大學數學系

八十七學年度碩士班甄試入學考試試題

數理統計

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1. Suppose that the observations are directions around a circle, i.e. of angles between 0 and 2π . Let Y_1, \dots, Y_n denote the angles collected. There are two claims on those angles. The first claim is that the random variables Y_1, \dots, Y_n are independent identically distributed in the uniform density over $(0, 2\pi)$. The second claim is that Y_1, \dots, Y_n are symmetrical clustering around the $\pi/2$ direction and $3\pi/2$ direction. Someone suggests to use the statistic $\sum_i |\sin Y_j|$ to test these two claims.
 1. Do you agree on the use of above statistic? Give reasons to justify your answer.
 2. When the first claim is correct, propose a good approximation on the distribution of $\sum_i |\sin Y_j|$ when n is large.
2. It is known that X_1 is normally distributed with mean θ_1 and variance 1 and X_2 is also normally distributed with mean θ_2 and variance 1. When $\theta_1 \leq \theta_2$, derive the maximum likelihood estimates of θ_1 and θ_2 .

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