

BY HENGJIAN CUI

Write (copy) the required excises, then give solutions by *yourself*.

**Copy excises each other is NOT permitted!**

EX12-1.

1. Let  $X_1, X_2, \dots, X_n (n > 2)$  iid.  $\sim N(\mu, \sigma^2)$ . Calculate  $E(R_n/S)$  and  $Var(R_n/S)$  numerically for  $n = 3, 4, 5, 6, 7$ , where  $R_n = \max\{X_i\} - \min\{X_i\}$ .

2. Generate 5 Cauchy random numbers  $\{x_1, x_2, \dots, x_5\}$  from the standard Cauchy distribution. Now we suppose those  $x_1, x_2, \dots, x_5$  iid.  $\sim f(x, \theta) = 1/[\pi(1 + (x - \theta)^2)]$ .

(1). Draw picture of the log-likelihood function.

(2). Find out the MLE.

(3). Calculate the expectation and variance of MLE by simulation.