1. Given $n$ independent observations: $X_1, X_2, \cdots, X_n \sim \text{Geo}(p)$, where $0 < p < 1$ is the unknown parameter, find the MLE of $p$.

2. Given $n$ independent observations $X_1, X_2, \cdots, X_n \sim \text{Exp}(\lambda)$. where $0 < \lambda < \infty$ is the unknown parameter, find the MLE of $\lambda$.

3. Given independent observations $X_1, \cdots, X_n \sim N(\mu_1, \sigma^2)$; $n > 2$; Independently we have also $Y_1, \cdots, Y_m \sim N(\mu_2, \sigma^2)$; $m > 2$. (all the random variables are independent here) Here we have 3 parameters: $\mu_1, \mu_2, \sigma^2$.

   Find the (simultaneous) MLE of the 3 parameters.

4. Given 4 independent observations $X_1 = 0.5, X_2 = 2.4, X_3 = 7, X_4 = -0.8$ from Cauchy distribution with density

   $$f_\theta(x) = \frac{1}{\pi} \frac{1}{1 + (x - \theta)^2}.$$ 

   Use a computer software to find the MLE of $\theta$. (numerical max).