Subject Assignment 2 موضوع الدرس

Date التاريخ

(1) $F = \alpha \, x^{\alpha-1} e^{-x^{\alpha}}$

$$L(\alpha) = \alpha^{n} \sum_{i=1}^{n} x_i^{\alpha-1} \, e^{-\sum_{i=1}^{n} x_i^{\alpha}}$$

$$\ln L(\alpha) = \ln\left(\alpha^{n} \sum x_i^{\alpha-1} e^{-\sum x_i^{\alpha}}\right)$$

$$= n \ln(\alpha) + (\alpha-1)\sum_{i=1}^{n} \ln(x_i) - \sum_{i=1}^{n} x_i^{\alpha}$$

$$\partial/_{\partial\alpha} \ln L(\alpha) = \frac{n}{\alpha} + \sum \ln x_i - \sum x_i^{\alpha} \ln(x_i) = 0$$

$$\frac{n}{\alpha} + \sum \ln(x_i) = \sum x_i^{\alpha} \ln(x_i)$$

$$\sum x_i^{\alpha} = \frac{n}{\alpha} \quad \therefore \alpha = \frac{\sum x_i^{\alpha}}{n}$$

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(2) $F(x) = \frac{\alpha}{\beta^{\alpha}} x^{\alpha-1} e^{-(x/\beta)^{\alpha}}$

$L = \prod_{i=1}^{n} \frac{\alpha}{\beta^{\alpha}} x_i^{\alpha-1} e^{-(x_i/\beta)^{\alpha}}$

$\log(L) = \sum_{i=1}^{n} \left(\ln \alpha - \alpha \ln \beta + (\alpha-1) \ln x_i - \left(\frac{x_i}{\beta}\right)^{\alpha} \right)$

$\partial L / \partial \alpha = \frac{n}{\alpha} - n \ln \beta + \sum \ln x_i - \sum \left(\frac{x_i}{\beta}\right)^{\alpha} \ln\left(\frac{x_i}{\beta}\right)$

$\partial L / \partial \beta = \frac{n\alpha}{\beta} - \alpha \sum \left(\frac{x_i}{\beta}\right)^{\alpha-1} \frac{x_i}{\beta^2}$

$\frac{n\alpha}{\beta} = \alpha \sum \left(\frac{x_i}{\beta}\right)^{\alpha-1} \frac{x_i}{\beta^2}$

(1) $\frac{1}{\alpha} - \ln \beta + \frac{1}{n} \sum \ln x_i = \frac{1}{n} \sum \left(\frac{x_i}{\beta}\right)^{\alpha} \ln\left(\frac{x_i}{\beta}\right)$

(2) $\beta = \left(\frac{1}{n} \sum x_i^{\alpha} \right)^{1/\alpha}$