

NAME : CHETALI PUSHKARNA
BATCH: CS8
ROLL NO 102117197

classmate

Date _____

Page _____

$$Q1) f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$$L(x_1, x_2, \dots, x_n) = \prod_{i=1}^n \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x_i-\mu)^2}{2\sigma^2}}$$

$$= \left(\frac{1}{\sqrt{2\pi\sigma^2}} \right)^n e^{-\frac{(\sum x_i - n\mu)^2}{2\sigma^2}}$$

Taking log on both sides

$$= n \ln \left(\frac{1}{\sqrt{2\pi\sigma^2}} \right) - \frac{(\sum x_i - n\mu)^2}{2\sigma^2} \quad \text{--- (1)}$$

Differentiate wrt μ

$$0 - \frac{\sum x_i^2 - n\mu^2 + 2\sum x_i n\mu}{2\sigma^2} = 0$$

$$n\mu = \sum x_i$$

$$\mu = \frac{\sum x_i}{n} = \frac{x_1 + x_2 + \dots + x_n}{n} = \bar{X}$$

Diff wrt σ^2

$$\frac{-n}{\sigma} + \frac{(\sum x_i - n\mu)^2}{\sigma^3} = 0$$

$$\sigma = \frac{\sum x_i - n\mu}{\sqrt{n}} = \frac{\sum x_i - n\bar{X}}{\sqrt{n}}$$

$$L(\theta) = \prod_{i=1}^n \theta^{x_i} (1-\theta)^{n-x_i}$$

Taking log on both side

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

diff wrt θ

$$= 0 + \frac{x_i}{\theta} + \frac{n-x_i}{1-\theta} \cdot (-1) = 0$$

$$\frac{x_i}{\theta} = \frac{n-x_i}{1-\theta}$$

$$x_i - \theta x_i = n\theta - x_i\theta$$

$$n\theta = x_i$$

$$\boxed{\theta = \frac{x_i}{n}}$$