22.1)

$$\therefore L(\mu, x) = e^{n\mu - \sum x_i}$$

$$\therefore rac{\partial L}{\partial \mu} = n e^{n\mu - \sum x_i} (ln(n\mu - \sum x_i))$$

$$\hat{\mu}^* = (\sum x_i + 1)/n > X_{(1)}$$

$$\therefore \hat{\mu}^* = X_{(1)}$$

不是无偏估计

$$E(\hat{\mu}^*) = \mu + 1$$

$$\therefore \hat{\mu}^{**} = X_{(1)} - 1$$

22.2)

$$\therefore E(x) = \mu + 1$$

$$\therefore \hat{\mu} = \overline{X} - 1$$

$$:: E(\hat{\mu}) = \mu$$

是无偏估计

22.3)

$$\because Var(\hat{\mu}^{**}) = 1, Var(\hat{\mu}) = 1/n$$

后者更有效

24)

$$L(\sigma^2,x)=(rac{1}{\sqrt{2n}\sigma})^nexp\{\sum-rac{(x_i-\mu_1)^2}{2\sigma^2}\}$$

$$lnL = nln(rac{1}{\sqrt{2n}\sigma}) - \sum rac{(x_i - \mu_1)^2}{2\sigma^2}$$

$$\because \frac{\partial lnL}{\partial \sigma^2} = 0$$

$$\therefore \hat{\sigma}^2 = rac{1}{n} \sum (x_i - \overline{X})^2$$

$$ext{::} E(\hat{\sigma}^2) = rac{n}{n-1} \sigma^2
ightarrow \sigma^2$$

::是弱相合估计

设k为 X_i 中有理数的个数

$$egin{split} L(heta,x) &= heta^k (1- heta)^{n-k} \ l(heta,x) &= kln heta + (n-k)ln(1- heta) \ dots \cdot \hat{ heta}^* &= k/n \end{split}$$

因为无理数基数大于有理数,所以不是相合估计