1. Let X_1, X_2 and X_3 be three independent random variables. X_1 is $\chi^2(3)$ and X_2 is $\chi^2(2)$ and X_3 is $\chi^2(2)$. Determine c such that

$$P\left\{\frac{X_1}{X_2+X_3} \leq c\right\} = .9$$

using one of the enclosed tables.

2. Let $X_1, X_2, \ldots, X_n$ be independent identically distributed random variables with density function

$$g(t,\theta) = \begin{cases} 0, & \text{if } t \notin [0,\theta] \\ \dfrac{2}{\theta^2}t, & \text{if } t \in [0,\theta]. \end{cases}$$

Find a moment estimator for θ.

3. Let $X_1, X_2, \ldots, X_n$ be independent identically distributed random variables with density function

$$h(t;\theta) = \begin{cases} 0, & \text{if } t \notin [0,1] \\ \theta t^{\theta-1}, & \text{if } t \in [0,1]. \end{cases}$$

Find the maximum likelihood estimator for θ.

4. Let X be a random variable with density function

$$f(t, \theta) = \frac{1}{(2\pi\theta)^{1/2}} e^{-t^2/(2\theta)}.$$

Compute the Cramer-Rao lower bound.

5. Let $X_1, X_2, \ldots, X_n$ be independent identically distributed random variables with density function

$$g(t,\theta) = \begin{cases} 0, & \text{if } -\infty < t < \theta \\ e^{-(t-\theta)}, & \text{if } \theta \leq t < \infty \end{cases}$$

Find the uniformly minimum variance estimator for θ (justify your answer).