Exponential Distribution

Introduction

- The exponential distribution has many applications in the field of statistics, particularly in the areas of reliability theory and waiting times or queuing problems.

- For example, in connection with Poisson process, the waiting time between successive arrivals (successes) has an exponential distribution.

Definition: The continuous random variable X has an exponential distribution, with parameter β, if its density function is given by

$$f(x) = \begin{cases} \frac{1}{\beta} e^{\frac{-x}{\beta}}, & x > 0 \\ \\ 0, & \text{elsewhere} \end{cases}$$

where $\beta > 0$

The mean and variance of the exponential distribution is given respectively by $\mu = \beta$ and $\sigma^2 = \beta^2$

Example 4.6

Suppose that a system contains a certain type of component whose time in years to failure is given by the random variable X. If five of these components are installed in different systems, what is the probability that at least two are still functioning at the end of 8 years?