Assignment 7

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Papoulis chap 4 Ex 4.7

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Problem

Q)The set of nonnegative real numbers $\{P_i\}$ satisfy $P\{x = X_i\} = P_i$ for all i. and $\sum_{i=1}^{\infty} P_i = 1$. Determine F(x).

Solution

For $x_i \leq x < x_i + 1$, We have
$\{x\{\xi\} \leq x\} = \bigcup_{x_k \leq x} \{x\{\xi\} = x\} = \bigcup_{k=1}^{i} \{x\{\xi\} = x\}$
and hence $F(x) = P\{x\{\xi\} \leq x\} = \sum_{k=1}^{i} p_k \qquad x_i \leq x < x_i + 1$
Here $F(x)$ is a staircase function with an infinite number of steps and the i^{th} step size equals P_i = 1,2,3,4,....., ∞
see the figure (1)

Staircase function Graph

The $F(x)$ graph is:

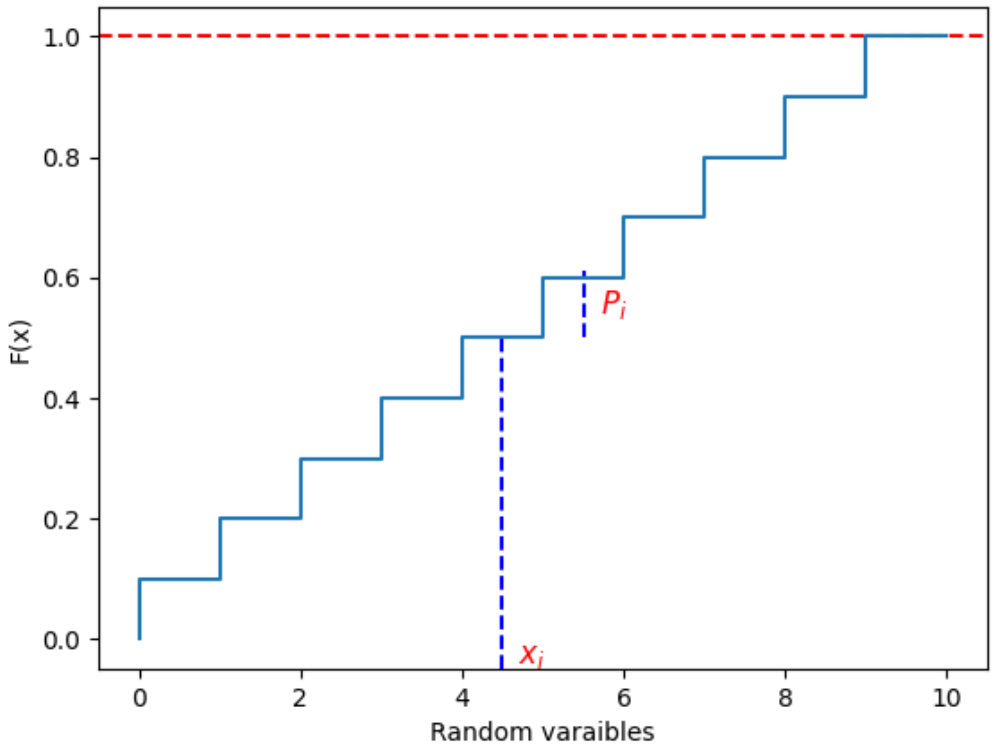

Figure: Staircase function

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