

If X is a r.v., then the expected value of the function $g(x)$, and denoted by $E[g(x)]$ is defined as:

$$E[g(x)] = \begin{cases} \sum_{\forall x} g(x) p(x) \rightarrow \text{D.r.v.} \\ \int_{\forall x} g(x) \cdot f(x) dx \rightarrow \text{C.r.v.} \end{cases}$$

EX(1) Find $E(x)$ for r.v. X if

$$p(x) = \begin{cases} \frac{1}{10} & ; x=1 \\ \frac{4}{10} & ; x=2 \\ \frac{2}{10} & ; x=3 \\ \frac{3}{10} & ; x=4 \\ 0 & ; x=5 \end{cases}$$

$$\begin{aligned} \underline{\underline{Sol}} \quad E(x) &= \sum_{\forall x} g(x) \cdot p(x) \\ &= \sum_{x=1}^4 g(x) \cdot p(x) \\ &= \sum_{x=1}^4 x \cdot p(x) \end{aligned}$$

$$= 1 \cdot \frac{1}{10} + 2 \cdot \frac{4}{10} + 3 \cdot \frac{2}{10} + 4 \cdot \frac{3}{10}$$

$$= \frac{1}{10} + \frac{8}{10} + \frac{6}{10} + \frac{12}{10} = \boxed{\frac{27}{10}} \quad \text{عدد حالي من المتغيرات}$$