1 Random Variables

1.1 Discrete random variable

For $A = \{k_1, k_2, ..., \}$ s.t. random variable$X \in A$, or $P(X \in A) = 1$, X is a random variable, with possible values $k_1, k_2, ...$ and $P(X = k_n) > 0$

1.1.1 Probability Mass Function (pmf)

The PMF is a function that defines the probability distribution for a discrete random variable. It gives the probability of the random variable taking on each possible value. The PMF, denoted as $P(X = x)$, satisfies two conditions:

$$P(X = x) \geq 0 \text{ for all x in the domain of } X \tag{1}$$

$$\sum_{x} P(X = x) = 1 \tag{2}$$

Example: For a fair six-sided die, the PMF would be $P(X = x) = \frac{1}{6}$ for $x = 1, 2, 3, 4, 5, 6$.

1.2 continuous Random Variables

Not rigorously defined in this class, but a continuous random variable is one that can take on any value in a range. The probability of a continuous random variable taking on a specific value is 0.