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cumulative distribution function

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Let X be a random variable. Define $F_X: \mathcal{R} \rightarrow [0, 1]$ as $F_X(x) = \Pr[X \leq x]$ for all x . The function $F_X(x)$ is called the *cumulative distribution function* of X .

Every cumulative distribution function satisfies the following properties:

1. $\lim_{x \rightarrow -\infty} F_X(x) = 0$ and $\lim_{x \rightarrow +\infty} F_X(x) = 1$,
2. F_X is a monotonically nondecreasing function,
3. F_X is continuous from the right,
4. $\Pr[a < X \leq b] = F_X(b) - F_X(a)$.

If X is a discrete random variable, then the cumulative distribution can be expressed as $F_X(x) = \sum_{k \leq x} \Pr[X = k]$.

Similarly, if X is a continuous random variable, then $F_X(x) = \int_{-\infty}^x f_X(y) dy$ where f_X is the density distribution function.