

1. **Facts about CDFs.** Suppose we have a random variable  $X$  and we know its CDF  $F_X$ . In terms of the CDF, what is

- $\mathbb{P}(X \leq 4)$
- $\mathbb{P}(X < 4)$
- $\mathbb{P}(X = 4)$
- $\mathbb{P}(X \geq 4)$
- $\mathbb{P}(X > 4)$
- $\mathbb{P}(X \neq 4)$

2. **Chebyshev's inequality.** Recall that we proved in class *Markov's inequality*: for  $X$  a nonnegative random variable,

$$\mathbb{P}(X \geq a) \leq \frac{\mathbb{E}[X]}{a}.$$

Use this to deduce *Chebyshev's inequality*, one of the most important inequalities in probability:

$$\mathbb{P}(|Y - \mathbb{E}[Y]| \geq a) \leq \frac{\text{Var}(Y)}{a^2}$$