recap Normal Distribution

μ = mean
σ = SD
σ^2 = Variance

$$X \sim N(\mu, \sigma^2)$$

$$f_X(x) = \frac{1}{\sqrt{\sigma^2 2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

Φ = standard normal cdf

Cool Properties

$$\frac{X-\mu}{\sigma} \sim N(0,1)$$

- $f(\mu + x) = f(\mu - x)$

PDF symmetric w/ μ in center

$X \sim N(\mu_X, \sigma_X^2)$, $Y \sim N(\mu_Y, \sigma_Y^2)$

- $X + Y \sim N(\mu_X + \mu_Y, \sigma_X^2 + \sigma_Y^2)$ if X, Y independent.

Central Limit Theorem

for iid $X_1 \dots X_n$ with mean μ, variance σ^2, and $S_n = \sum_n^i X_i$, distribution of $\frac{S_n - \mu n}{\sigma\sqrt{n}}$ converges to standard normal as $n \to \infty$.

also $S_n \sim N(n\mu, \sigma^2 n)$.

if you sample from any arbitrary distr. the distribution of sample averages will be approximately normal.