

$$X = N(0, 1)$$

$$Y = \text{Cauchy}(0, 1)$$

$$Z_n = X + \frac{1}{n} Y \xrightarrow{\infty} X$$

$$\sqrt{n} (\bar{X}_n - \mu) = Y$$

$$\bar{X}_n = \frac{Y}{\sqrt{n}} + \mu$$

$$E(\bar{X}_n) = \mu$$

$$\text{var}(\bar{X}_n) = \frac{\text{var}(Y)}{n} = \frac{\sigma^2}{n}$$