$$|R(X,Y)| \leq 1$$

Cauchyova nerovnost

$\vec{x}(x_1, \ldots, x_n)$ $\vec{y}(y_1, \ldots, y_n)$

$$\cos\alpha = \frac{|(\vec{x}, \vec{y})|}{\|\vec{x}\| \cdot \|\vec{y}\|} \leq 1$$

$X \sim N(0,1)$

$M_X(t) = e^{\frac{t^2}{2}}$

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

$Y = \mu + \sigma X$

$X \sim N(0,1)$

$M_Y(t) = e^{\mu t} \cdot e^{\frac{\sigma^2 t^2}{2}}$

$$f(x) = \frac{b^a}{\Gamma(a)} \cdot x^{a-1} \cdot e^{-bx}$$

$$\Gamma(a, b)$$

$\chi^2(1)$: $$f(x) = \frac{1}{\sqrt{2\pi}} \cdot x^{-\frac{1}{2}} \cdot e^{-\frac{x}{2}}$$

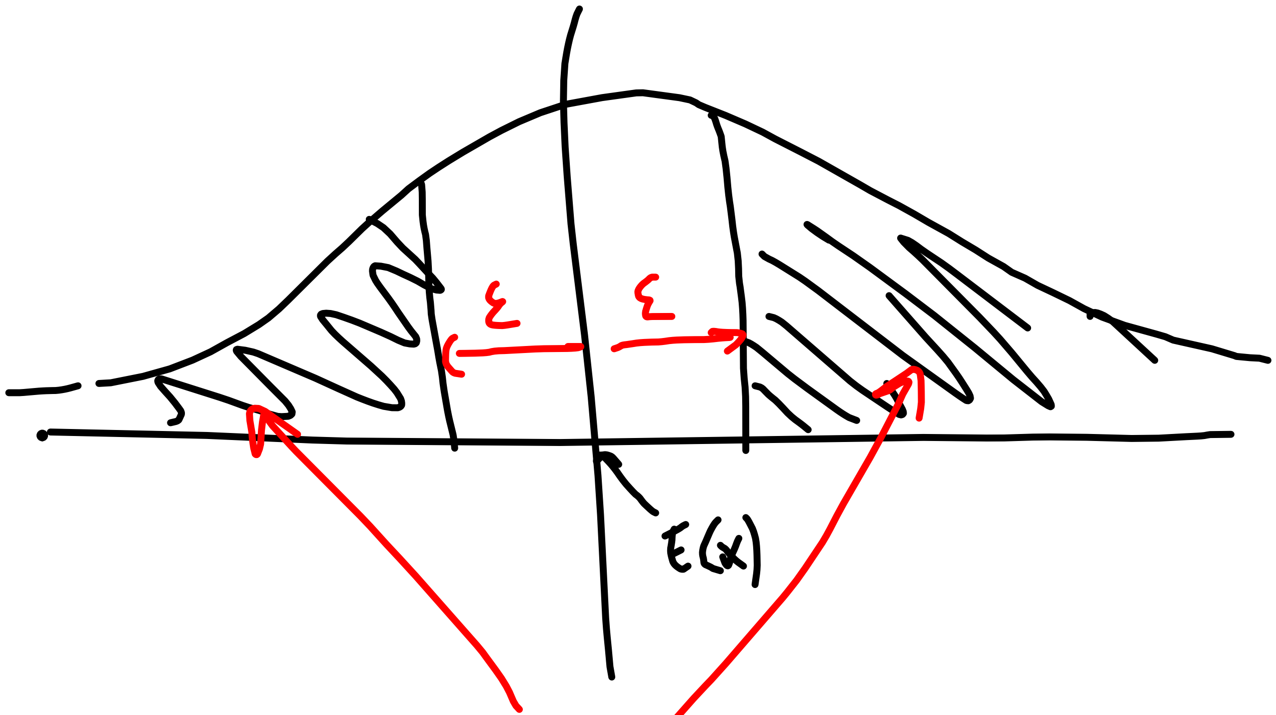
$a = \frac{1}{2}$ $b = \frac{1}{2}$

$$\frac{\left(\frac{1}{2}\right)^{\frac{1}{2}}}{\Gamma\left(\frac{1}{2}\right)} = \frac{1}{\sqrt{2\pi}}$$

$X_n \sim Bi(n, p)$

$$\lim_{n \to \infty} \frac{X_n - np}{\sqrt{np(1-p)}} \sim N(0,1)$$

> 9



$N(0,1)$

$$P(|X - E(X)| > \varepsilon)$$

Řeš: ad 1)

$$P(|X-\mu| \geq \underbrace{3\sigma}_{\varepsilon}) \leq \frac{\sigma^2}{\varepsilon^2} = \frac{1}{9}$$

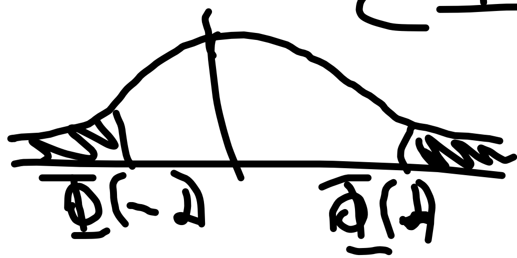
ad 2) $X \sim N(0,1)$

$$P(|X-\mu| \geq 3\sigma) = P(|X| \geq 3)$$

$$= 1 - P(-3 \leq X \leq 3) = 1 - (\Phi(3) - \Phi(-3))$$

$$= 2 - 2\Phi(3) \approx 0{,}0027$$

$$\Phi(-\alpha) = 1 - \Phi(\alpha)$$



$$Y_n \sim Bi(n, p)$$

$$E(Y_n) = n \cdot p \qquad D(Y_n) = np(1-p)$$

<u>Čeb. ner.:</u>

$$P(|Y_n - np| > \varepsilon) \leq \frac{np(1-p)}{\varepsilon^2}$$

$$P\left(\left|\frac{Y_n}{n} - p\right| > \frac{\varepsilon}{n}\right) \leq \frac{np(1-p)}{\varepsilon^2}$$

$$\varepsilon_1 := \frac{\varepsilon}{n} \quad P\left(\left|\frac{Y_n}{n} - p\right| > \varepsilon_1\right) \leq \frac{p(1-p)}{n \cdot \varepsilon_1^2}$$

rel. četnost $\frac{Y_n}{n}$ ... $\frac{5}{600}$ $(n=600)$

p ... ?

$$P\left(\left|\frac{Y_n}{n}-p\right|>0{,}01\right)\le\frac{p(1-p)}{n\cdot 0{,}01^2}$$

$\varepsilon = 0{,}01$; předp.: ~~$p < 0{,}02$~~

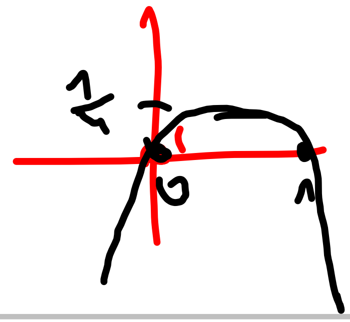
$$P_{(\ldots)}\le\frac{p(1-p)}{600\cdot 0{,}01^2}=\frac{p(1-p)}{0{,}06}\le\frac{1}{4}\cdot\frac{1}{0{,}06}=\frac{1}{4}\cdot\frac{100}{6}$$

$p < 0{,}02$

$$P(\ldots)\le\frac{0{,}02\cdot 0{,}98}{600\cdot 0{,}01^2}\sim 0{,}33$$

$f(p)=p(1-p)$

$f(p)\le\frac{1}{4}$



$$Y = \sum_{i=1}^{n} Y_i$$

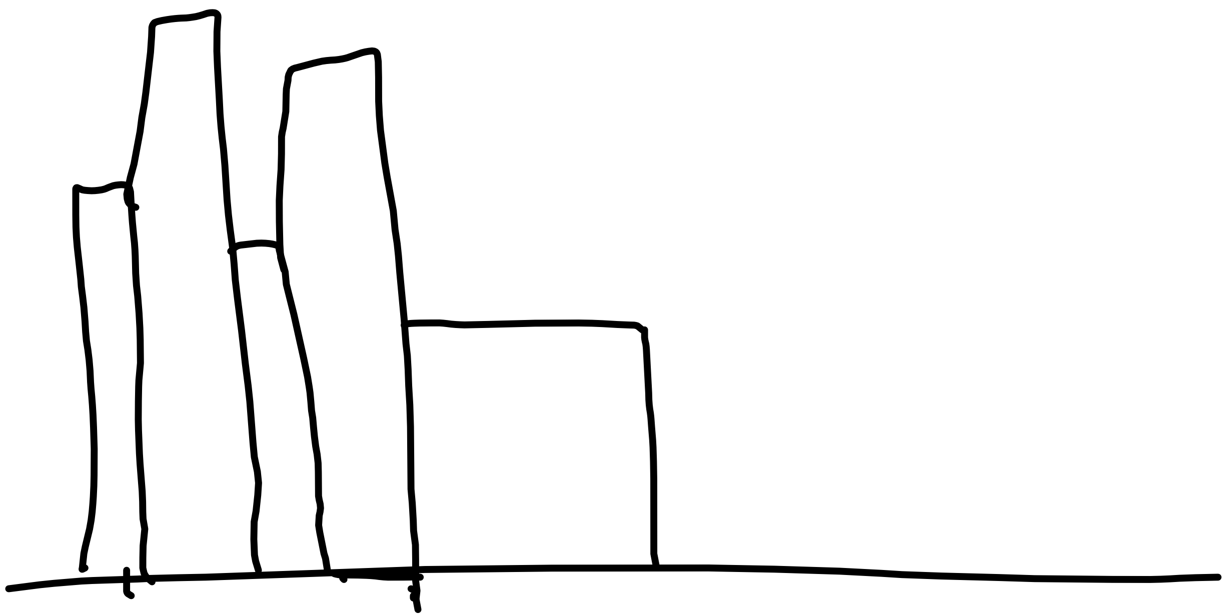
$$E(Y) = n \cdot \mu$$

$$D(Y) = D\left(\sum Y_i\right) = n\sigma^2$$

$$S_m = \frac{Y - E(Y)}{\sqrt{D(Y)}} = \frac{Y - n\mu}{\sqrt{n} \cdot \sigma} = \frac{\sum (Y_i - \mu)}{\sqrt{n} \cdot \sigma}$$

$$Y_i \sim A(p) \quad Y = \sum_{i=1}^{n} Y_i \sim Bi(n, p)$$

$$D(Y) = np(1-p) \quad S_m = \frac{Y - np}{\sqrt{np(1-p)}}$$



$$\frac{1}{n}\sum_{i=1}^{n} x_i \geq \sqrt[n]{x_1 \dots x_n} \geq \frac{n}{\frac{1}{x_1} + \dots \frac{1}{x_n}}$$

A G H

$x_1 \leq \ldots \leq x_n$ n liché

medián $= x_{\frac{n+1}{2}}$

n sudé

$$\frac{x_{\frac{n}{2}} + x_{\frac{n}{2}+1}}{2}$$ --- medián