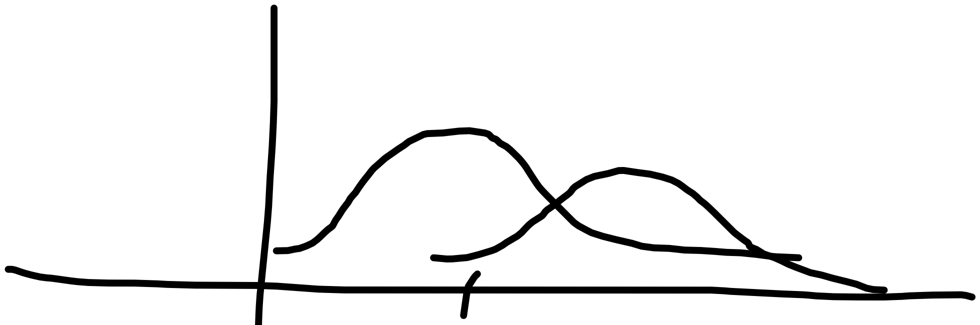
p ... počet restaurací v Brně

psť, že najdu konkrétního studenta v konkrétní restauraci $\approx \dfrac{1}{7p}$

psť, že tam nebude $\approx 1 - \dfrac{1}{7p}$

psť, nepotkám nikoho $\approx \left(1 - \dfrac{1}{7p}\right)^{380}$ ← počet studentů



st. hr.

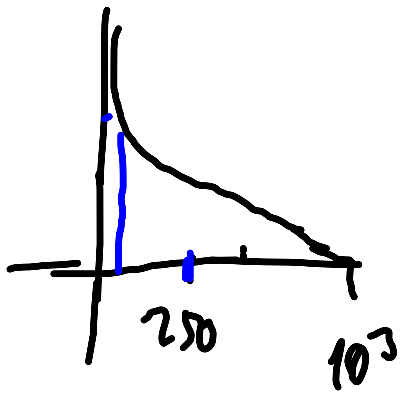
pro $0 \leq a < 10^3$

$$P[V < a] = P[X^3 < a] = P[X < \cdot$$

$$= P[X < \sqrt[3]{a}] = \frac{\sqrt[3]{a}}{10}$$

$$F(A) = \begin{cases} 0 & \text{pro } A \leq 0 \\ \frac{\sqrt[3]{A}}{10} & \text{pro } 0 < A < 10^3 \\ 1 & \text{pro } A \geq 10^3 \end{cases}$$

$$f(A) = \begin{cases} 0 & \text{pro } A \leq 0 \\ \frac{1}{30\sqrt[3]{A^2}} & \text{pro } 0 < A < 10^3 \\ 0 & \text{pro } A \geq 10^3 \end{cases}$$

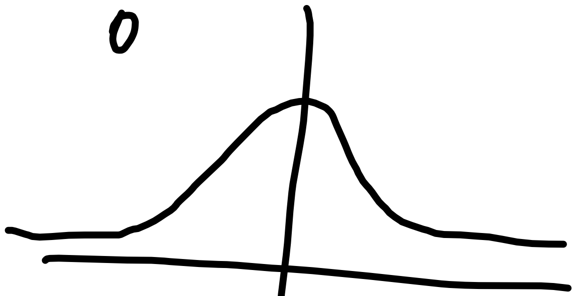


$$EX = \int_{-\infty}^{\infty} x f(x)\,dx = \frac{1}{30}\int_{0}^{10^3} x^{\frac{1}{3}}\,dx = \frac{1}{40}\left[x^{\frac{5}{3}}\right]_0^{1000} =$$

$$= 250$$

$$\operatorname{var} X = \int_{-\infty}^{\infty} (EX - x)^2 f(x)\,dx = \frac{1}{30}\int_0^{10^3} (250 - x)^2 \frac{1}{\sqrt[3]{x^2}}\,dx =$$

$$\doteq 80357{,}14$$

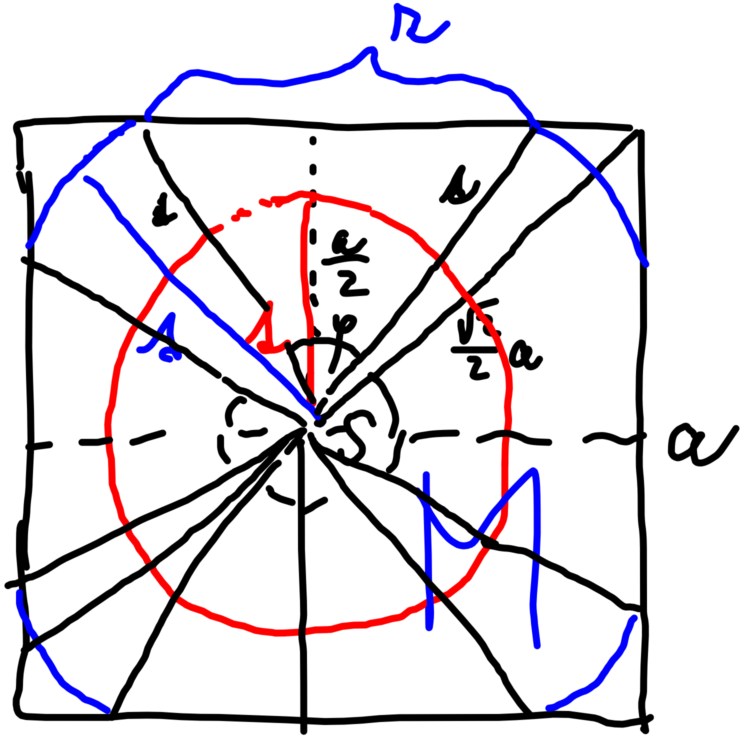


$$P[V < a] = \frac{1}{2} \Rightarrow \frac{\sqrt[3]{a}}{10} = \frac{1}{2} \Rightarrow \sqrt[3]{a} = 5 \Rightarrow \boxed{a = 125}$$

Vzdálenost (X) se pohybuje v mezích $0 \le X \le \frac{\sqrt{2}}{2}a$

Pro $0 \le s \le \frac{a}{2}$: $P[X \le s] = P[X \in K_{S,s}] =$

$$= \frac{\pi s^2}{a^2}$$



pro $\frac{a}{2} \le s \le \frac{\sqrt{2}}{2}a$

$$P[X \le s] = P[X \in M] =$$

$$= \frac{1}{a^2}\left(\left(\pi - 4\arccos\left(\frac{a}{2s}\right)\right)s^2 + 2\frac{\sqrt{s^2-\frac{a^2}{4}}}{a}\right)$$

$\cos\varphi = \frac{a}{2s}$

$\varphi = \arccos\left(\frac{a}{2s}\right)$, obsah kruh. výseče je

$$\frac{2\pi - 8\overbrace{\arccos\left(\frac{a}{2b}\right)}^{\varphi}}{2\pi} \cdot \left(\pi b^2\right)$$

---

obsah trojúhelníčků: $\frac{h}{2} = \sqrt{b^2 - \frac{a^2}{4}}$

jeden $\triangle$: $S = \frac{a}{2} \cdot \sqrt{b^2 - \frac{a^2}{4}}$

všechny 4: $2a\sqrt{b^2 - \frac{a^2}{4}}$

Distribuční fce vektoru (X, Y) je fcí $\mathbb{R}^2 \to \mathbb{R}$: $F(a, b) = P(X < a \,\&\, Y < b)$

pro spojité:

$$F_X(a) = \lim_{y \to \infty} F(a, y)$$

pro hustotu platí pak

$$f_X(a) = \int_{-\infty}^{\infty} f(a, y)\, dy$$

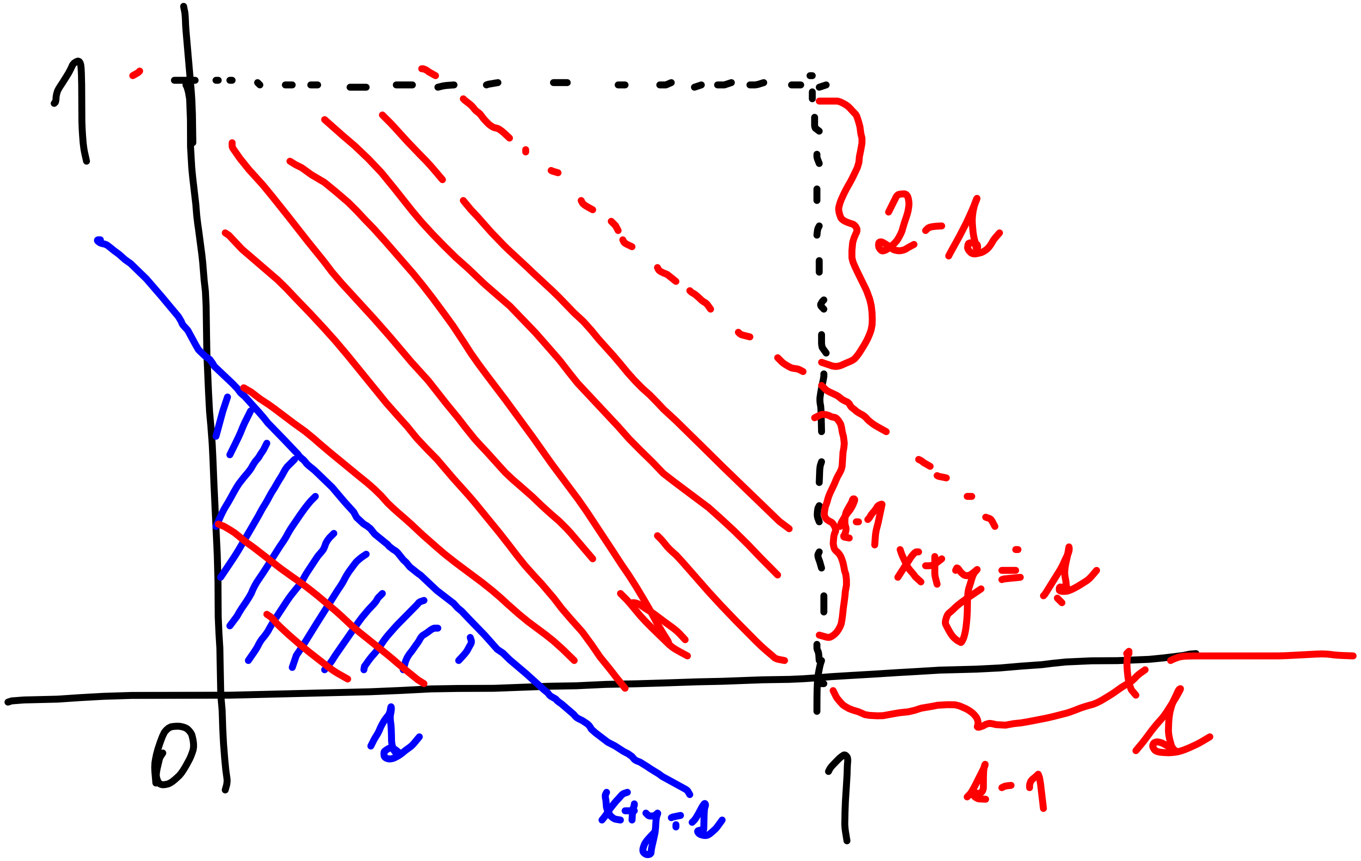
Pro diskrétní veličiny X, Y, takové, že

X nabývá hodnot $x_1, x_2, \dots$

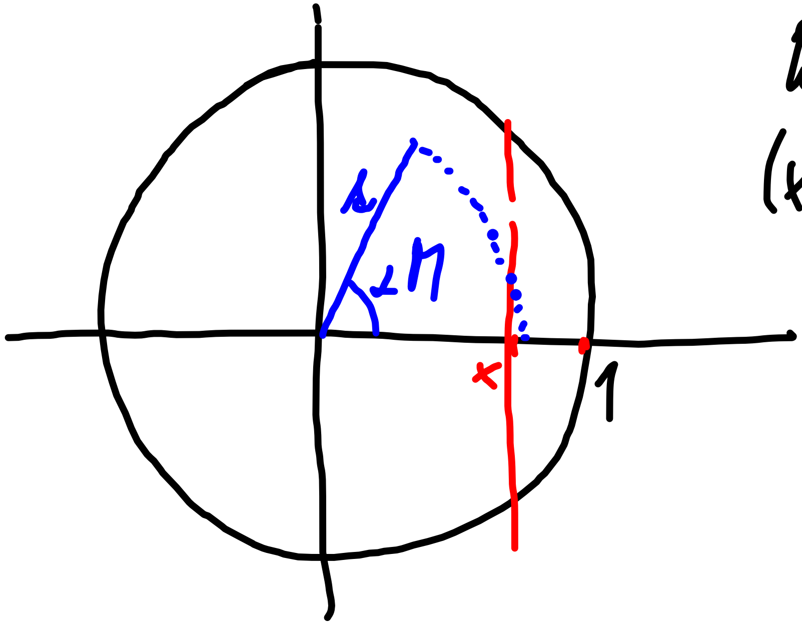
Y —— " —— $y_1, y_2, \dots$

Označme pro lib. x_i, y_j pravd. $P[X=x_i, Y=y_j]$,

tak potom $P[X=x_i] = \sum_{i=1} P[X=x_i, Y=y_j]$



$$P\{X+Y \le t\} = \begin{cases} \frac{t^2}{2} & \text{pro } 0 \le t \le 1 \\ 1 - \frac{(2-t)^2}{2} & \text{pro } 1 \le t \le 2 \\ 0 & \text{pro } t \le 0 \\ 1 & \text{pro } t \ge 2 \end{cases}$$



Kartézské souřadnice bodu (X,Y) vybraného s rovnoměrným rozdělením uvnitř daného kruhu nejsou nezávislé.

Pro polární souřadnice R, φ vypočteme

$$F(s,\alpha) = P[R<s, \varphi<\alpha] = P[(R,\varphi)\in M] =$$

$$= \frac{\frac{\alpha}{2\pi}\cdot \pi s^2}{\pi} = \frac{\alpha s^2}{2\pi}$$

$$f(s,\alpha) = \frac{\partial^2 F(s,\alpha)}{\partial s\, \partial \alpha} = \frac{s}{\pi} \qquad \begin{cases} s \in \langle 0,1\rangle \\ \varphi \in \langle 0,2\pi) \end{cases}$$

Pro marginální hustoty pak máme

$$g(r) = \int_{-\infty}^{\infty} f(r,\varphi)\,d\varphi = \int_0^{2\pi} \frac{r}{\pi}\,d\varphi = 2r$$

(pro $0 \le r \le 1$)

Pro hustotu pdf úhlu φ pak máme

$$h(\varphi) = \int_{-\infty}^{\infty} f(r,\varphi)\,dr = \int_0^1 \frac{r}{\pi}\,dr = \frac{1}{2\pi}$$

(pro $0 \le \varphi \le 2\pi$)

Odtud

$$\underbrace{f(r,\varphi)}_{\text{hustota } (R,\varphi)} = \underbrace{g(r)}_{\text{hustota } R} \cdot \underbrace{h(\varphi)}_{\text{hustota } \varphi}$$