## Ex 12 - Cap 3

Sejam $U_1, U_2, \ldots$ v.a.'s iid $U(0,1)$.

Defina,

$$N = \min\left\{n : \sum_{i=1}^{n} U_i \geq 1\right\}$$

Estime $\mathbb{E}(N)$.

$N_1, N_2, \ldots, N_n$ iid

$$\sum_{i=1}^{n} \frac{N_i}{n} \longrightarrow \mathbb{E}(N)$$

## Ex 13 - Cap 3

Sejam $U_1, U_2, \ldots$ v.a. iid $U(0,1)$

Defina

$$M = \max\left\{n : \prod_{i=1}^{n} U_i \geq e^{-3}\right\}$$

Estime $\mathbb{E}(M)$.

$U_1 \geq e^{-3}$

$U_1 U_2 \geq e^{-3}$

$U_1 U_2 U_3 \geq e^{-3}$

$U_1 U_2 U_3 U_4 < e^{-3}$

$N_1$

$N_2$

$N_3$

① Estimação $\pi$

Algoritmo:

① $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$

$X_i \sim U(0,1)$ indep.

$Y_i \sim U(0,1)$

② $g(X_i, Y_i) = \begin{cases} 1 \text{ se } X_i^2 + Y_i^2 \leq 1 \\ 0 \text{ c.c.} \end{cases}$, $i = 1, \dots, n$

③ $\frac{\sum_{i=1}^{n} g(X_i, Y_i)}{n} \xrightarrow{\text{P.Q.C.}} \frac{\pi}{4}$

$\hat{\pi} = 4 \cdot \frac{\sum_{i=1}^{n} g(X_i, Y_i)}{n}$

n grande!!