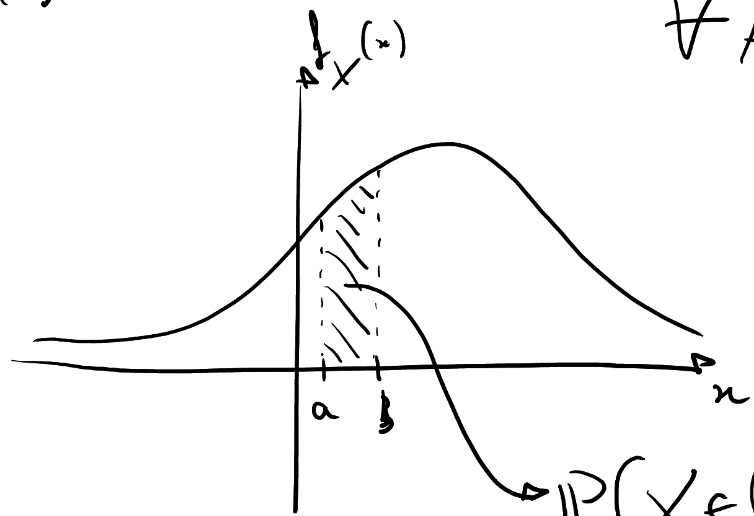
V.A. CONTINUE

PDF (F.NE DI DENSITA' DI PROB.)

$$\mathbb{P}(X \in A) = \int_A f_X(x)\,dx \qquad \forall A \subseteq \mathbb{R}$$



$\mathbb{P}(X \in (a,b))$

$a < b$

$a, b \in \mathbb{R}$

$I_m(X)$ INSIEME DISCRETI

$I_m(X)$ INSIEME CONTINUO

$$\mathbb{P}(a < X < b) = \int_a^b f_X(x)\,dx$$

$$\mathbb{P}(X \in [a,b]) = \mathbb{P}(a \le X \le b) = \int_a^b f_X(x)\,dx$$

$$f_X$$

$$\mathbb{P}(X \in A) = \int_A f_X(x)\,dx$$

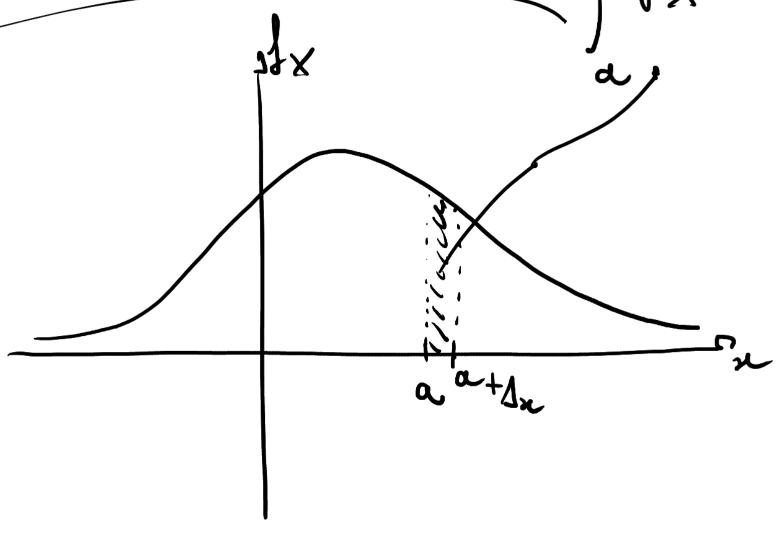
$$\forall A \subseteq \mathbb{R}$$

$$A = \{a\} \qquad \mathbb{P}(X = a) = \int_a^a f_X(x)\,dx = 0$$

$$(a, a+\Delta x) \qquad \Delta x > 0$$

$$\mathbb{P}(X \in (a, a+\Delta x)) = \mathbb{P}(a < X < a+\Delta x)$$

$$= \int_a^{a+\Delta x} f_X(x)\,dx$$



OSS||:

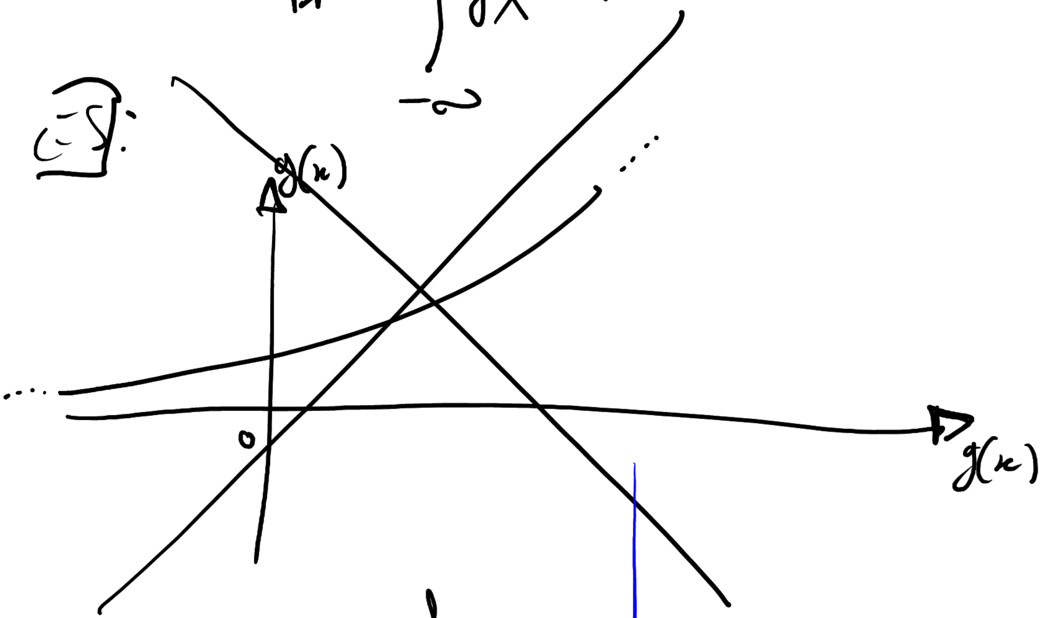
$$\mathbb{P}(X \in \mathbb{R}) = \mathbb{P}(-\infty < X < +\infty)$$

$$= \mathbb{P}\left(\{\omega \in \Omega \,/\, X(\omega) \in \mathbb{R}\}\right)$$

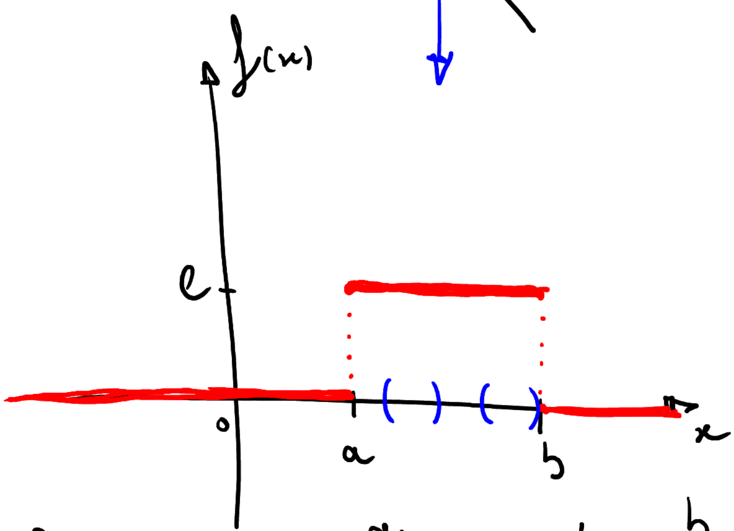
$$= \mathbb{P}(\Omega) = 1$$

$$\int_{-\infty}^{+\infty} f_X(x)\,dx$$

ES||:



ES||



$a, b \in \mathbb{R}$
$a < b$

$$\underset{\sim}{1} = \int_{-\infty}^{+\infty} f(x)\,dx = \cancel{\int_{-\infty}^{a} f(x)\,dx} + \int_{a}^{b} f(x)\,dx + \cancel{\int_{b}^{+\infty} f(x)\,dx}$$

$$= \int_a^b \ell \, dx = \ell \int_a^b dx = \ell \cdot [x]_a^b$$

$$= \ell \cdot (b-a)$$

$$\Leftrightarrow \ell = \frac{1}{b-a}$$

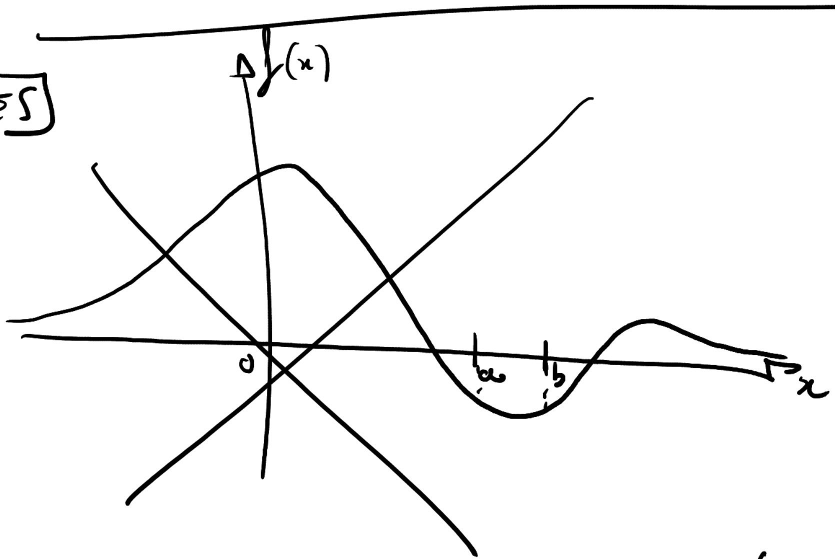
QUINDI LA PDF DI X È

$$f(x) = \begin{cases} \frac{1}{b-a}, & a < x < b, \\ 0, & \text{ALTROVE}. \end{cases}$$

f È LA PDF DI UNA V.A. UNIFORME.

$$X \sim Un((a,b))$$

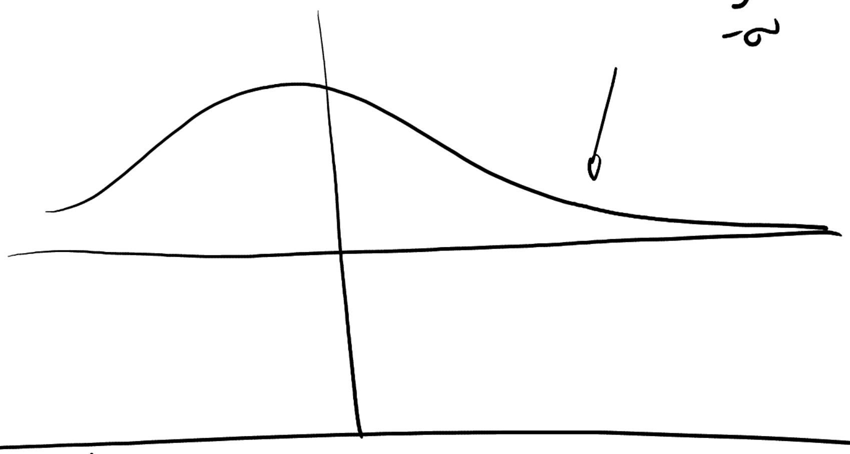
ES



$\forall A \subseteq \mathbb{R}$,

$$\mathbb{P}(X \in A) = \boxed{\int_A f(x)\,dx}$$

SE $\displaystyle\int_{-\infty}^{+\infty} g(x)\,dx = C > 0$ ALLORA $\displaystyle\int_{-\infty}^{+\infty} \frac{g(x)}{C}\,dx = 1$



V.A. NOTE:

$$X \sim \text{Uniforme}\left([a,b]\right) \qquad a,b \in \mathbb{R}, \; a<b.$$

LA PDF È

$$f_X(x) = \begin{cases} 0, & x<a, \\ \frac{1}{b-a}, & a<x<b, \\ 0, & b<x, \end{cases}$$

$$\| $$

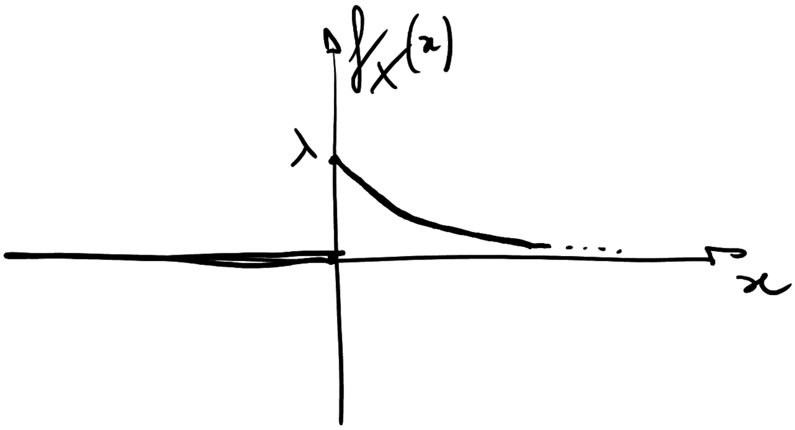
$$\frac{1}{b-a} \cdot \mathbb{1}_{[a,b]}(x)$$

V.A. ESPONENZIALE:

$$X \sim \text{Exp}(\lambda), \qquad \lambda>0$$

SE HA LA SEGUENTE PDF:

$$f_X(x) = \begin{cases} \lambda e^{-\lambda x}, & x>0 \\ 0 & x<0 \end{cases}$$



$$e^{-\lambda x} = \left(\frac{1}{e^{+\lambda}}\right)^{x}$$

- USATA PER RAPPRESENTARE TEMPI DI VITA
- $\mathbb{P}(X > m \mid X > n) = \mathbb{P}(X > m - n)$

$m \in \mathbb{R}$ $\quad$ $m > n$
$n \in \mathbb{R}$

PROPRIETÀ DI ASSENZA DI MEMORIA

V.A. NORMALE:

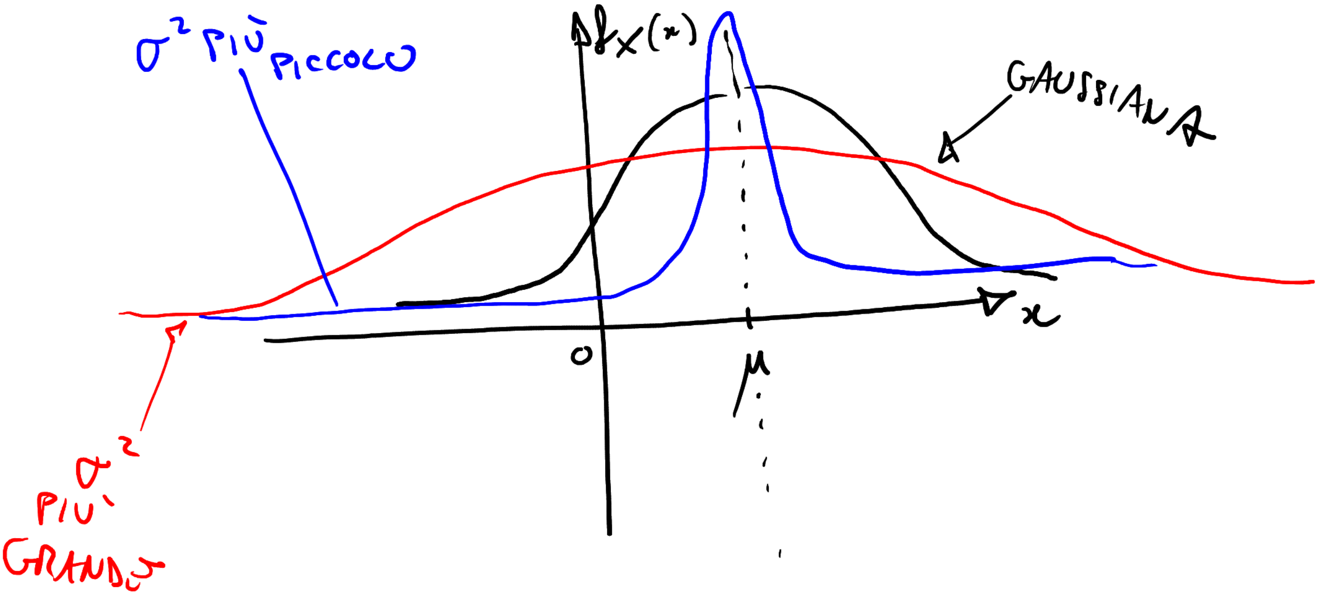
$$X \sim N(\mu, \sigma^2)$$

$\mu \in \mathbb{R}$
$\sigma^2 \in \mathbb{R}_+$

HA PDF:

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

GAUSSIANA



PROPRIETÀ:

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

ALLORA $Y = a \cdot X + b$ $\quad a, b \in \mathbb{R}$.

SI DISTRIBUISCE COME UNA

$$N(a\mu + b, \; a^2\sigma^2)$$

NB LA V.A. NORMALE È "INVARIANTE PER TRASFORMAZIONI LINEARI"