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Distribuição Exponencial

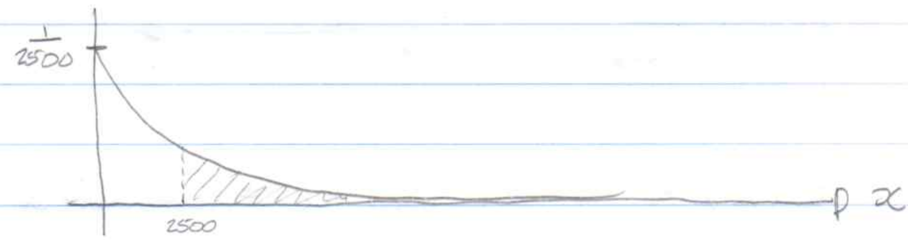
O tempo de duração de um componente electrónico A tem distribuição exponencial de média 2500 horas.

a) X - "tempo de duração de um componente electrónico (horas)"

$X \sim Ex(\lambda)$

$E(X) = 2500 = \frac{1}{\lambda}$ $\Rightarrow$ (formulário)

$\lambda = \frac{1}{2500}$



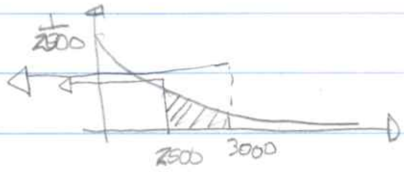
a) $P(X > 2500) = 1 - P(X \leq 2500)$

$= 1 - F(2500)$

$= 1 - \left(1 - e^{-\frac{1}{2500} \times 2500}\right)$

$= e^{-1} \cong 0,3679$

b) $P(2500 < X < 3000)$



$= P(X < 3000) - P(X \leq 2500)$

$= F(3000) - F(2500)$

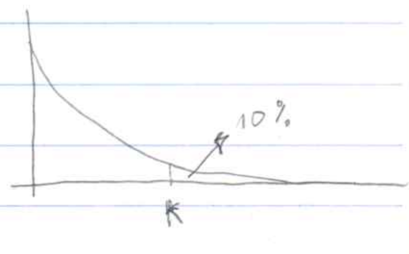
$= 1 - e^{-\frac{3000}{2500}} - \left(1 - e^{-\frac{2500}{2500}}\right)$

$= e^{-1} - e^{-\frac{30}{25}} \cong 0,0667$

c) Det k: $P(X > k) = 0,1$

$1 - P(X \leq k) = 0,1$

$P(X \leq k) = 0,9$



$F(k) = 0,9$

$1 - e^{-\frac{1}{2500}k} = 0,9$

$e^{-\frac{k}{2500}} = 0,1$

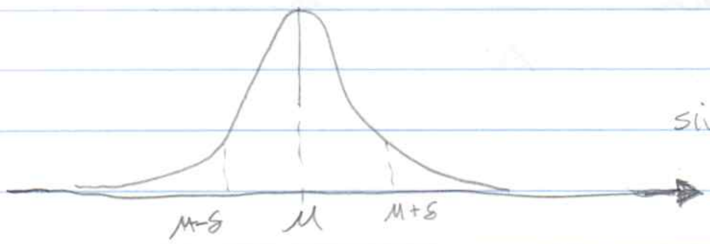
$\frac{-k}{2500} = \ln(0,1) \Rightarrow k = -2500 \ln(0,1)$

$= 5756$ horas.

—//—

Distribuição Normal a mais importante.

$$X \sim N(\mu, \sigma^2) \Leftrightarrow f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)}, x \in \mathbb{R}$$



simetrico

Area igual a 1

$$E(X) = \int_{-\infty}^{+\infty} x \cdot f(x)\, dx = \text{conclui-se} = \mu$$

$$V(X) = \int_{-\infty}^{+\infty} (x-\mu)^2 \cdot f(x)\, dx = \ldots = \sigma^2$$

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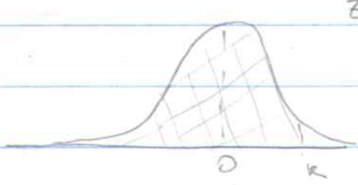
Distribuição Normal Reduzida

$Z \sim N(0;1)$

$$f(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}, \quad z \in \mathbb{R}$$

$Z \sim N(0,1)$



$$P(Z < k) = \int_{-\infty}^{k} f(z)\,dz$$

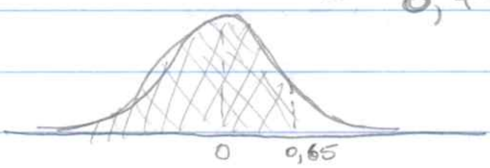
$$= \int_{-\infty}^{k} \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}}\,dz \cong \Phi(k)$$

$\downarrow$

valores obtidos numericamente

a) $P(Z < 0{,}65) = \Phi(0{,}65)$

$= 0{,}7422$



casio fx-570 SP

DC Normal
- Inf -99999
- Sup $0{,}65$
- δ 1
- μ 0

b)

$P(Z > 0{,}24) = 1 - P(Z \leq 0{,}24)$

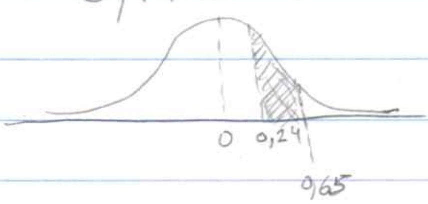
$= 1 - \Phi(0{,}24)$

$= 1 - 0{,}594$

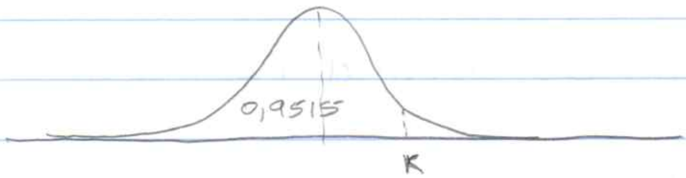
c) $P(0{,}24 < Z < 0{,}65) = \Phi(0{,}65) - \Phi(0{,}24)$

$= 0{,}1473$

- Inf $0{,}84$
- Sup $0{,}65$
- δ 1
- μ 0



d) det K: $P(Z < K) = 0,9515$



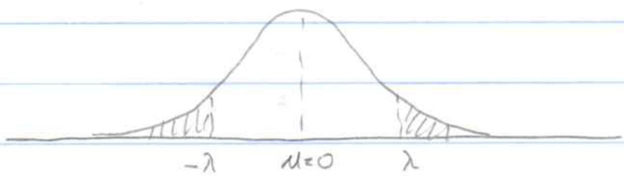
$$\Phi^{-1}(\Phi(K)) = \Phi^{-1}(0,9515)$$
$$K = \Phi^{-1}(0,9515)$$
$$= 1,6595$$

Normal inversa

casio $\begin{cases} \text{Area} : 0,9515 \\ \sigma : 1 \\ \mu : 0 \end{cases}$

"• casos possíveis explorados."

$$P(Z < -\lambda) = P(Z > \lambda)$$



$$\Phi(-\lambda) = 1 - P(Z \leq \lambda)$$
$$\Phi(-\lambda) = 1 - \Phi(\lambda)$$

ex: $\Phi(-1,31) = 1 - \Phi(1,31)$