Sinais discretos básicos

x_k x_t

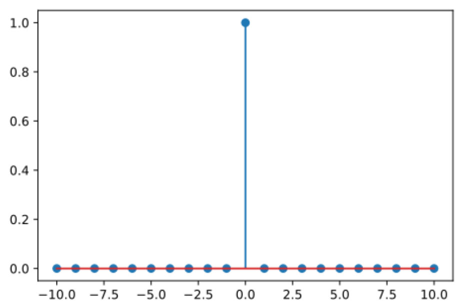
$x[t]$ ou $x[k]$ t ou $k \in \mathbb{Z}$

Impulso:

$$\delta[k] = \begin{cases} 1 & k = 0 \\ 0 & k \neq 0 \end{cases}$$

stem

lolipop



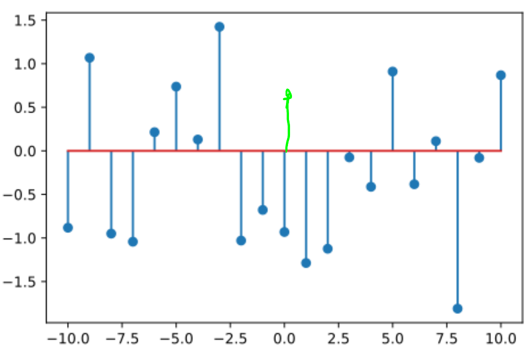
Propiedades:

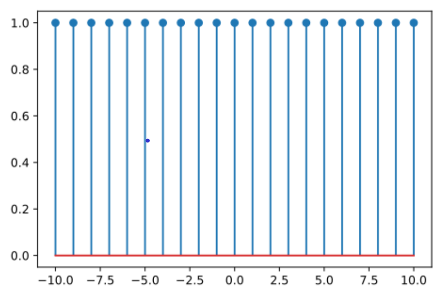
$$x[k]\,\delta[k] = x[0]\,\delta[k]$$

$$x[k]\,\delta[k-n] = x[n]\,\delta[k-n]$$

$$\sum_{n} x[n]\,\delta[k-n] = x[k]$$

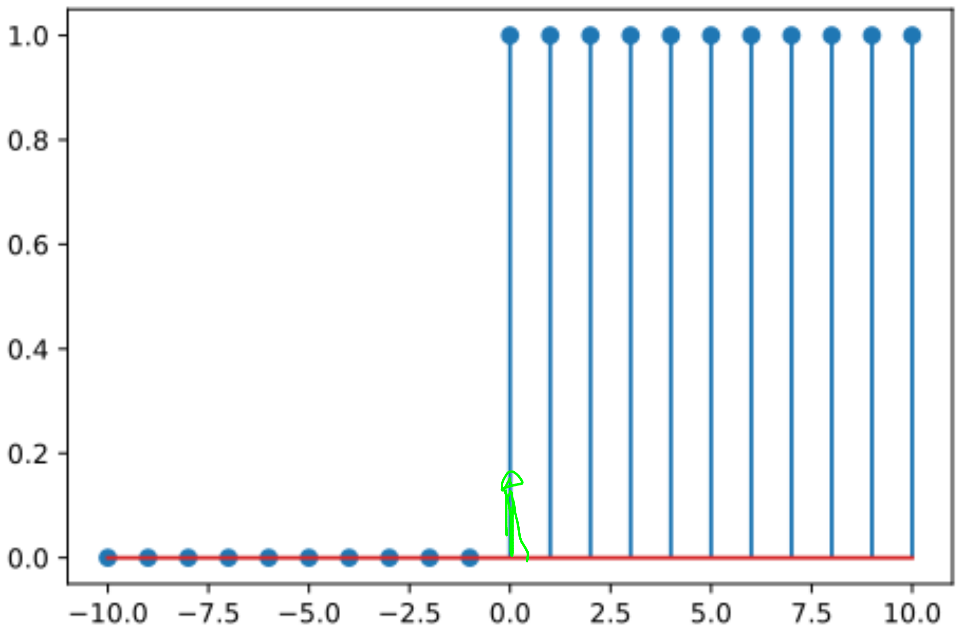
$$y(t) * \delta(t) = y(t)$$





Degrau

$$u[k] = \begin{cases} 1 & k \geq 0 \\ 0 & k < 0 \end{cases}$$



Lembre-se

$$\frac{d\,u(t)}{dt} = \delta(t) \Rightarrow$$

$$\rightarrow u(t) = \int_{-\infty}^{t} \delta(\tau)\, d\tau$$

$$u[k] = \sum_{n=-\infty}^{k} \delta[n]$$

$$u[0] = \sum_{n=-\infty}^{0} \delta[n] = \ldots 0 + 0 + 0 + 1 = 1$$

$$u[1] = \sum_{n=-\infty}^{1} \delta[n] = \ldots + 0 + 0 + 0 + 1 + 0 = 1$$

$$r[5] = \sum_{n=-\infty}^{5} u[n] = + \ldots + 0 + 0 + 1 + 1 + 1 + \ldots + 1 = 5$$

$$I[k] = I[k-1] + novo[k]$$

eq. diferenças
recursão

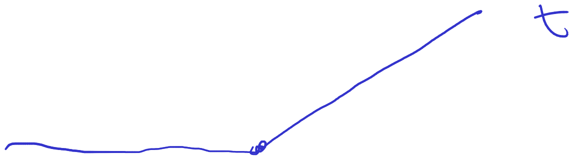
$$\Updownarrow$$

$$I[k] = \sum_{n=-\infty}^{k} novo[n]$$

$$novo = [\;0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \;]$$

Rampa

Cont: $r(t) = t\,u(t) = \begin{cases} t & t \geq 0 \\ 0 & t < 0 \end{cases}$



Discreta: $r[k] = k\,u[k] = \begin{cases} k & k \geq 0 \\ 0 & k < 0 \end{cases}$

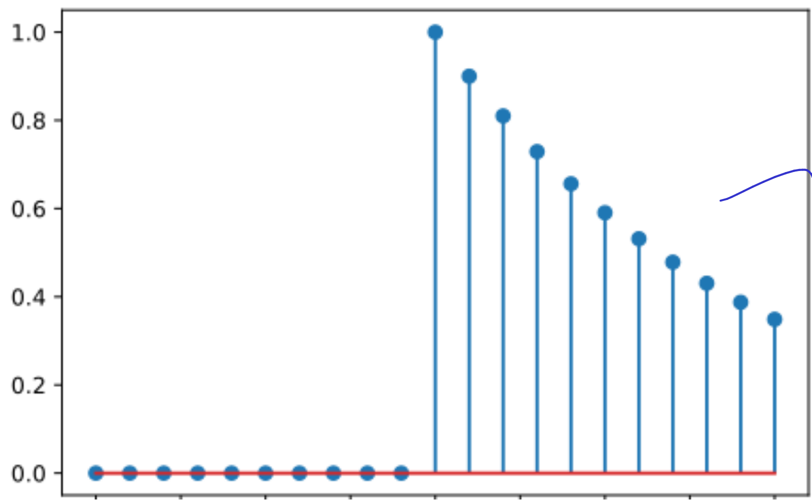
Exponencial

$$a^k u[k] \quad a \in R$$

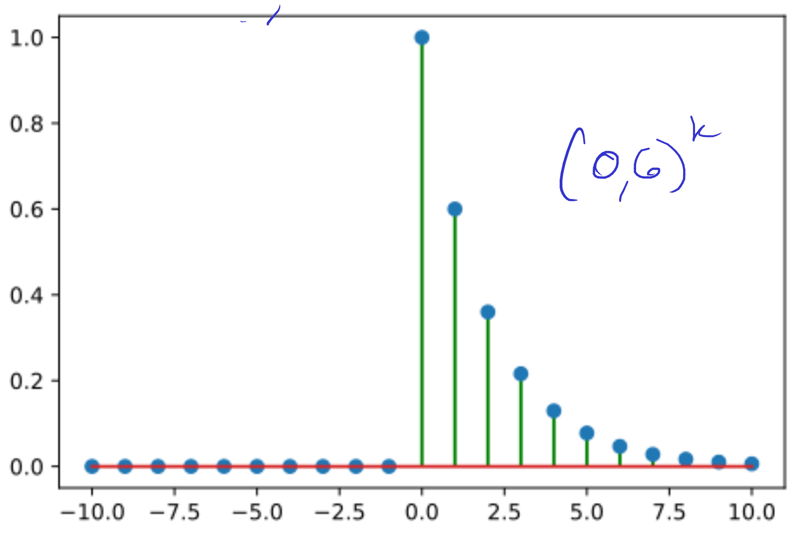
Obs: não usemos mais

$$e^{-ak} = (e^{-a})^k$$

1: $0 < a < 1$

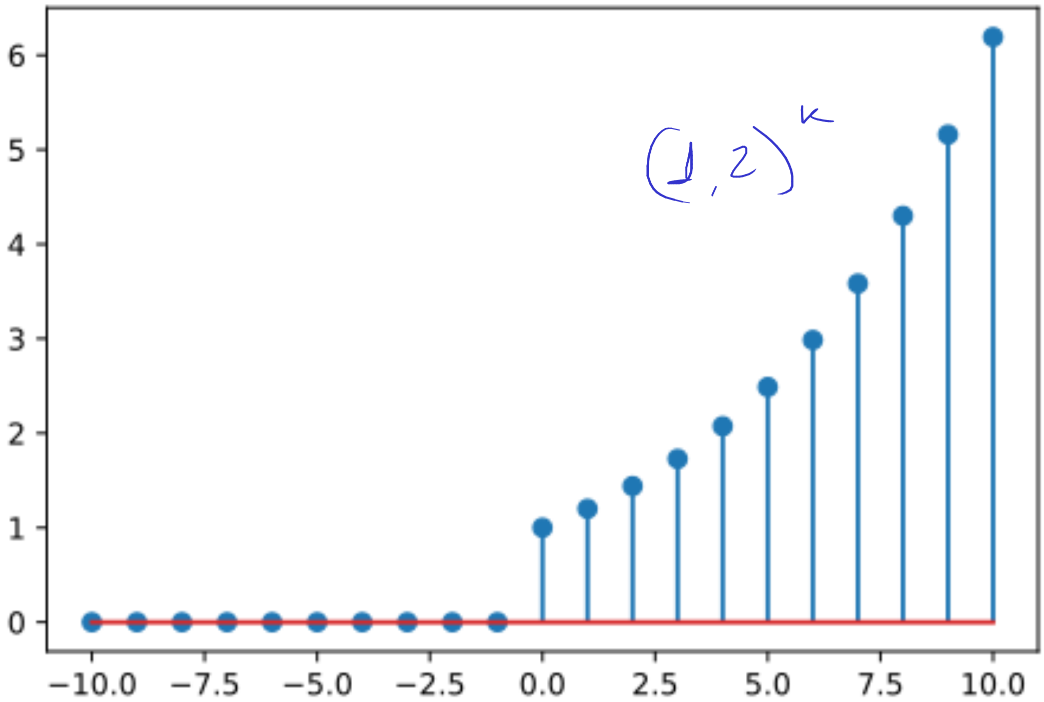


$(0,9)^k$

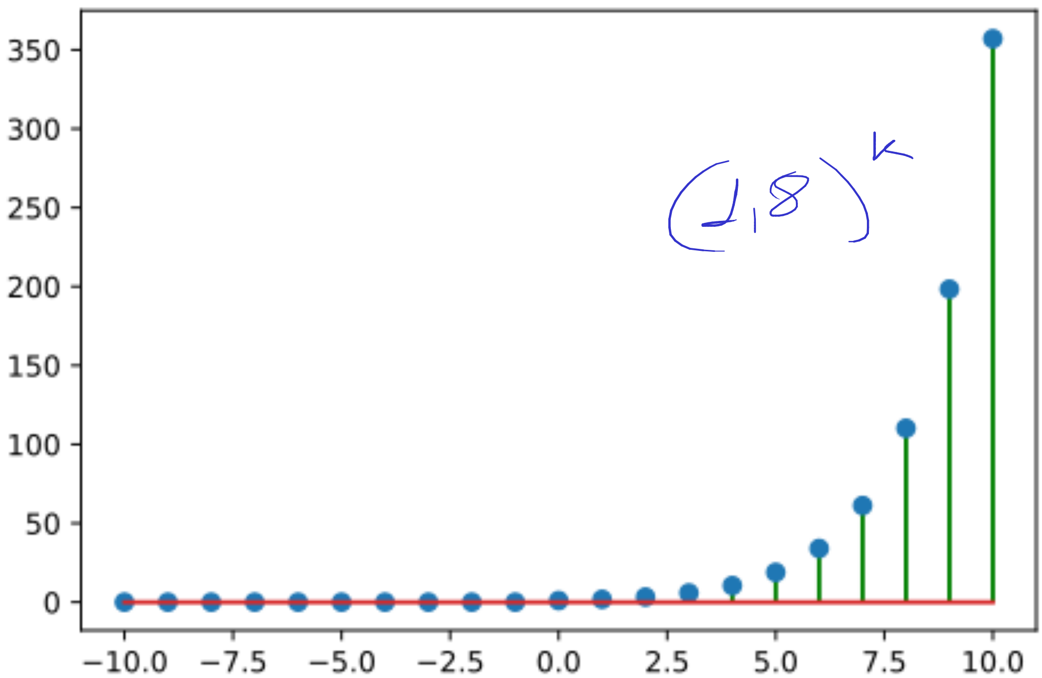


$(0,6)^k$

$a > 1$



$(1,2)^k$
6
5
4
3
2
1
0
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0



$(1,8)^k$
350
300
250
200
150
100
50
0
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0

a complexo $(\in \mathbb{C})$

$a \in \mathbb{C}, |a| = 1$ $\quad a = |a| e^{j\angle a}$

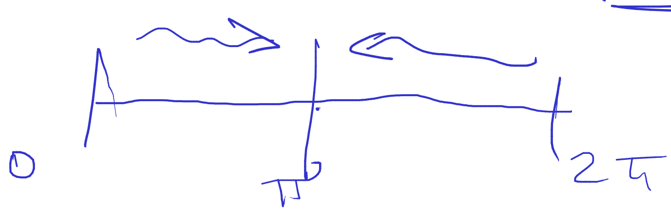
$x[k] = \mathrm{Re}\{e^{j\omega k}\}$

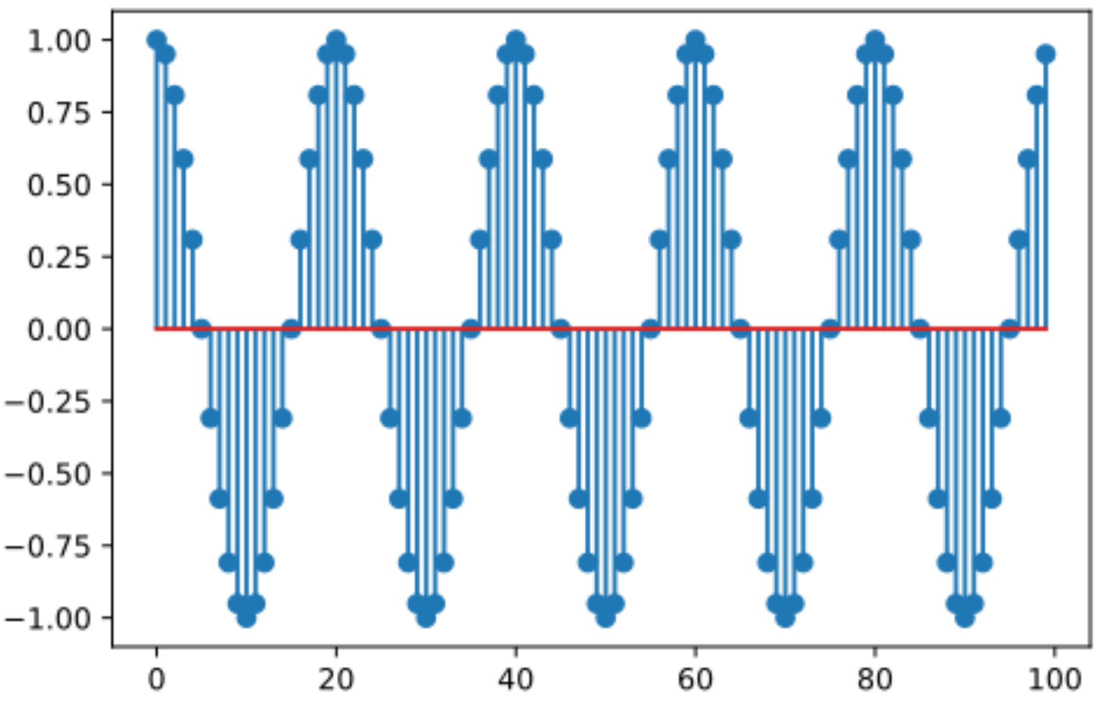
$= \cos \omega k$

$0 < \omega < 2\pi$

$\omega > 2\pi \Rightarrow \omega = 2\pi + \Omega$

$\omega k = \underline{\underline{2\pi k}} + \Omega k$

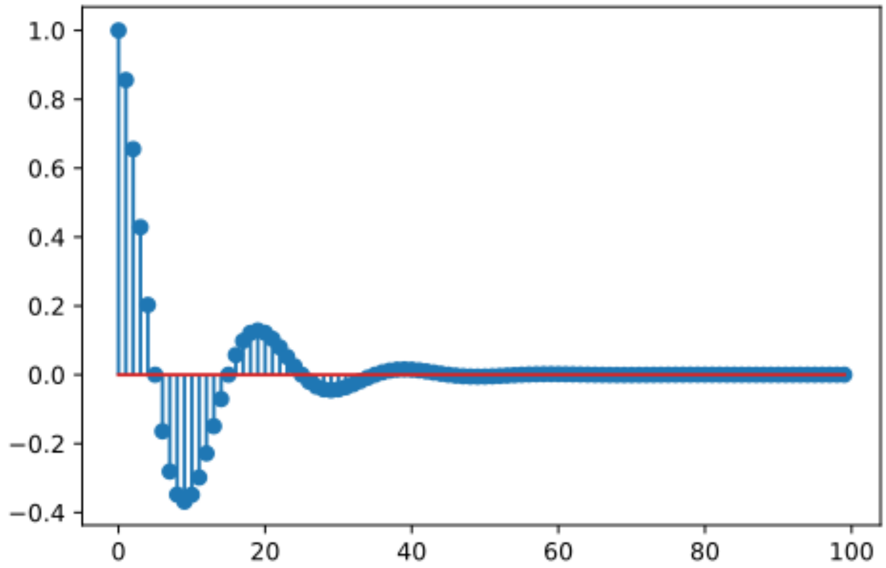




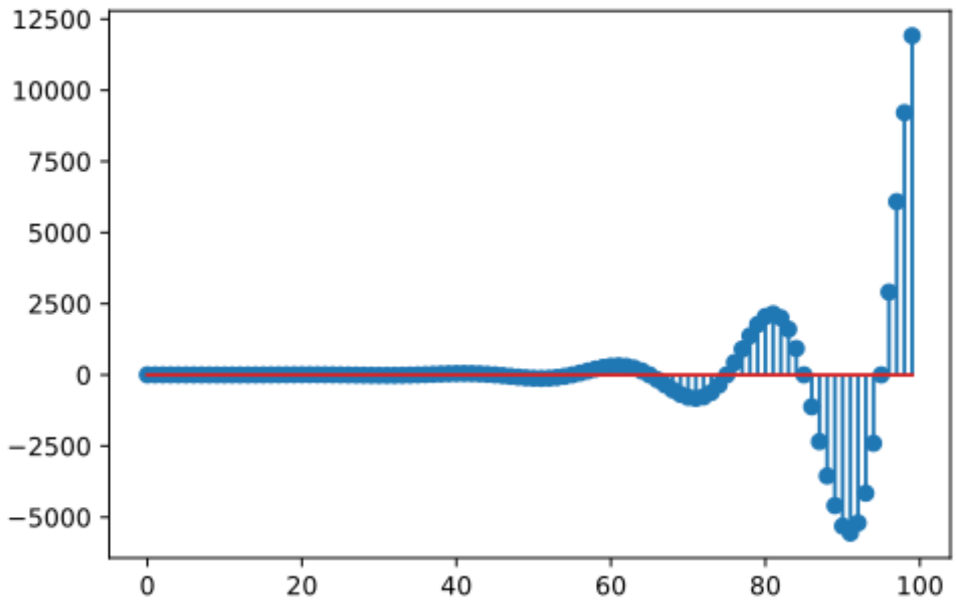
$2\pi \cdot 0{,}5 = \pi \Rightarrow e^{jk\cdot\pi} \Rightarrow \cos k\pi$

$|a| < 1$

$a = 0{,}9\, e^{j 2\pi \cdot 0{,}05}$

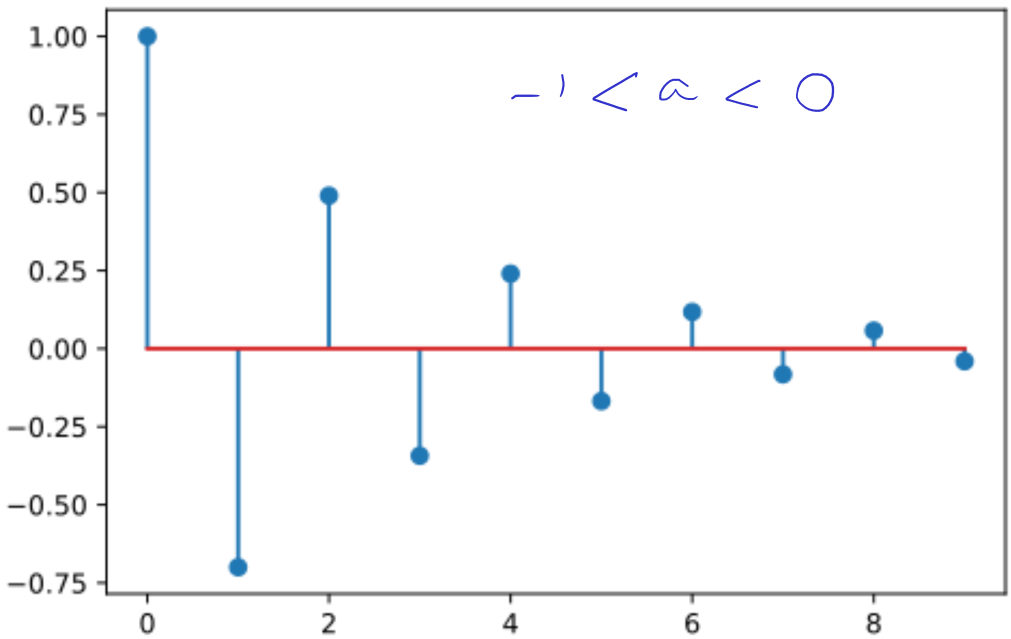


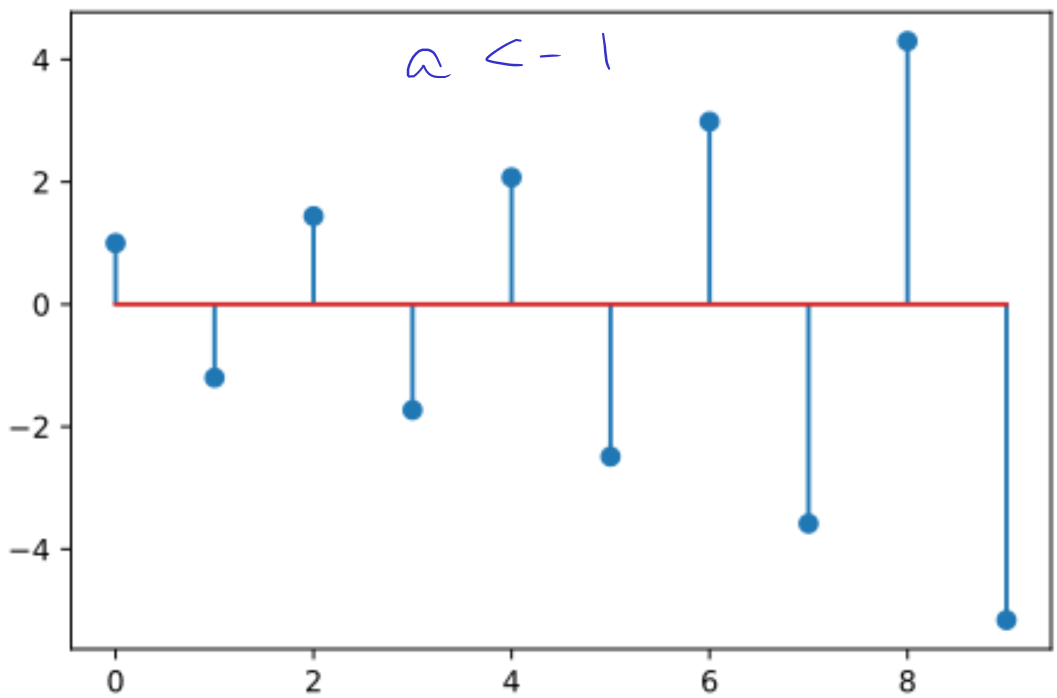
$|a| > 1$

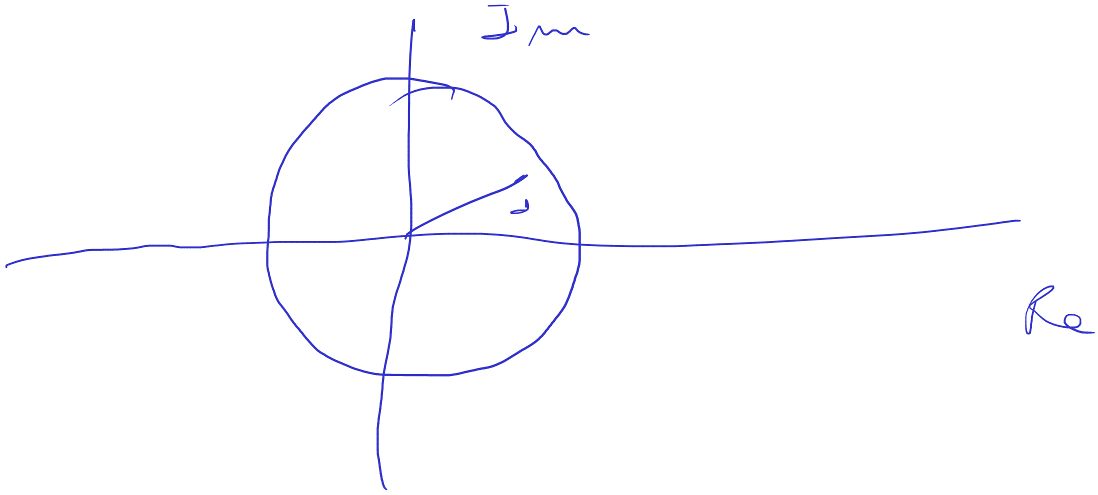


$a < 0$

$(-0,9)^t$






Im
Re

Aspectos práticos de sequências.

Vetores

Recursão

$y[k] = 0{,}9\, y[k-1]$ $\qquad y[0] = 1$

$\longrightarrow y[k] = 0{,}9^k$

$y[k+1] = 0{,}9\, y[k]$

$y[k] = y[k-1] + y[k-2]$

$y[0] = 0, \quad y[1] =$