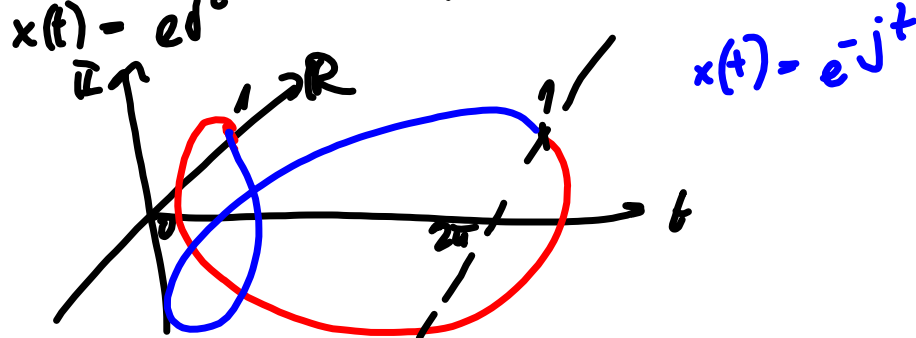
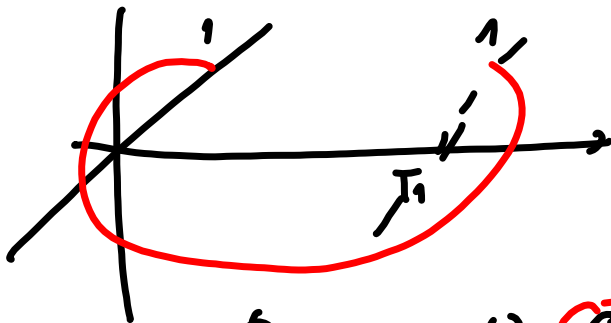


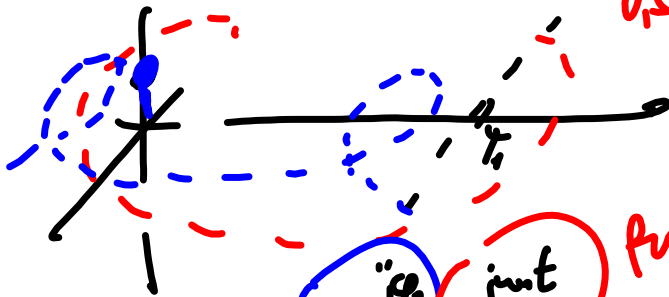
Komplexní exponenciála



uvazujeme frekvenci $f_1 = 50 \text{ Hz}$ $T_1 = \frac{1}{50}$
 $x(t) = e^{j\omega t} = e^{j2\pi f_1 t}$ ω , kruhová frekvence.

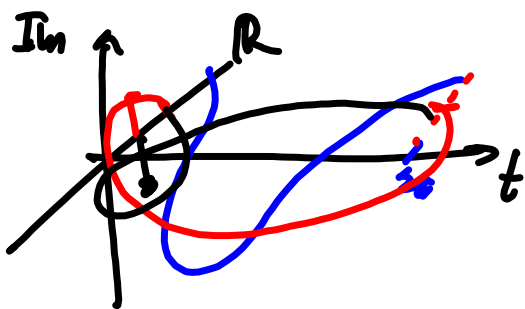


obecná komplex. exp. $x(t) = C_1 e^{j(\omega t + \phi_1)}$
 $0.5 e^{j\omega t + \pi/2}$ $e^{a+b} = e^a \cdot e^b$

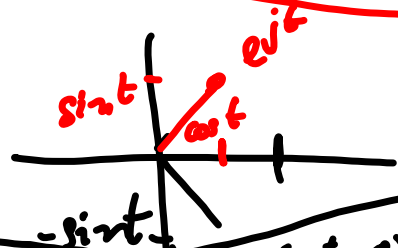


$C_1 e^{j\phi_1}$ konstanta $e^{j\omega t}$ funkce
 kdy bude start?
 $t=0$ $x(0) = C_1 e^{j\phi_1}$
 $0.5 e^{j\pi/2}$

Cos ze dvou komplex. exp



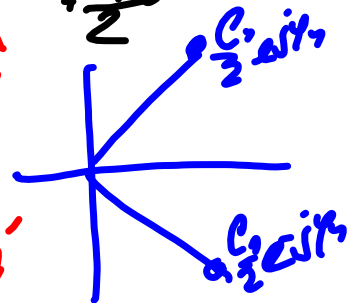
$$\cos t = \frac{e^{jt} + e^{-jt}}{2}$$



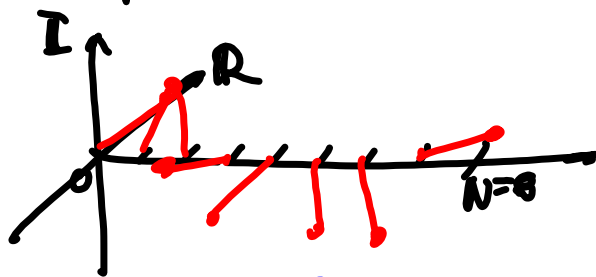
$$x(t) = C_1 \cos(\omega_0 t + \varphi_1) = \frac{C_1}{2} e^{j(\omega_0 t + \varphi_1)} + \frac{C_1}{2} e^{-j(\omega_0 t + \varphi_1)} =$$

$$= \frac{C_1}{2} e^{j\varphi_1} e^{j\omega_0 t} + \frac{C_1}{2} e^{-j\varphi_1} e^{-j\omega_0 t}$$

* —————> komplexní sdružení



Komplex. exp s dist. časem.



$$x[n] = e^{j2\pi \frac{n}{N}}$$

$\frac{1}{N}$ norm. frekv.
 $\omega_1 = \frac{2\pi}{N}$ norm. 0 frekvence.

Oblučná:

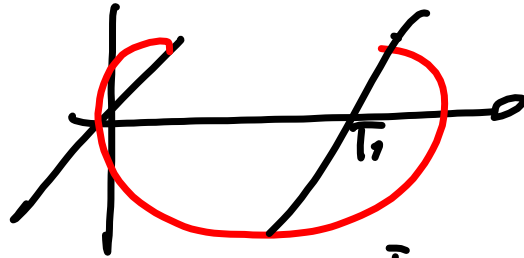
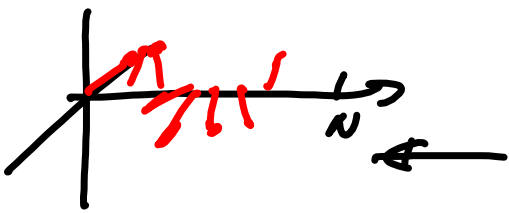
$$x[n] = \underline{C}_1 e^{j(\omega_1 n + \varphi_1)}$$

$$= \underline{C}_1 e^{j\varphi_1} e^{j\omega_1 n}$$

konst. posloupnost

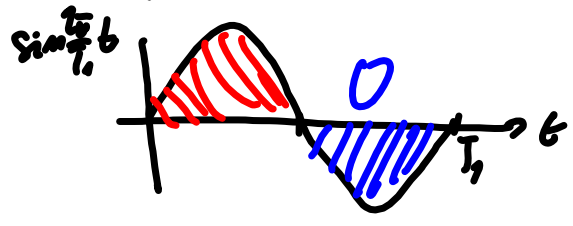
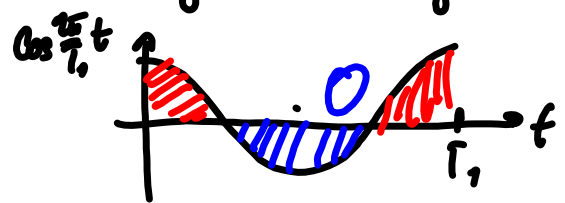
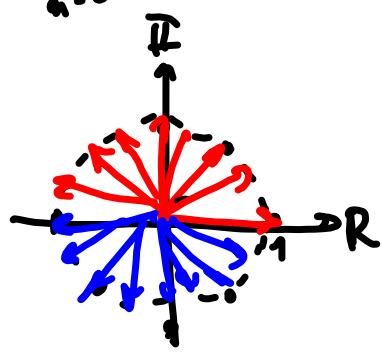
$$x[n] = C_1 \cos(\omega_1 n + \varphi_1) = \frac{C_1}{2} e^{j\varphi_1} e^{j\omega_1 n} + \frac{C_1}{2} e^{-j\varphi_1} e^{-j\omega_1 n}$$

Součet: komplex. exp za 1 periodu
 $x[n] = e^{j\frac{2\pi}{N}n}$ $x(t) = e^{j\frac{2\pi}{T_1}t}$



$$\sum_{n=0}^{N-1} x[n] = 0$$

$$\int_0^{T_1} x(t) dt = \int_0^{T_1} (\cos \frac{2\pi}{T_1}t + j \sin \frac{2\pi}{T_1}t) dt = 0$$



$$N_1 = \frac{9000}{440} = 18.18$$

$$f_1 = 440 \text{ Hz} \quad \frac{1}{f_2} = T_1 = \frac{1}{440} = 2,3 \text{ ms}$$

$$\frac{1}{f_2} \cdot F_s = 18.18$$

