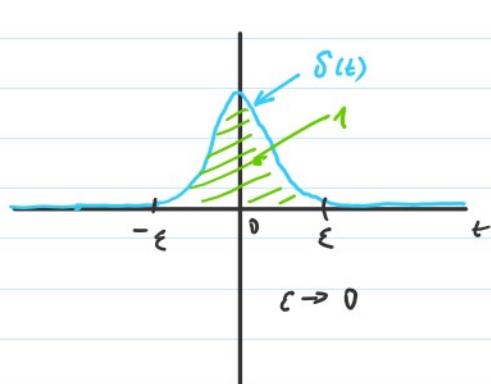


Poznámky ke 3. přednášce



Spolutice

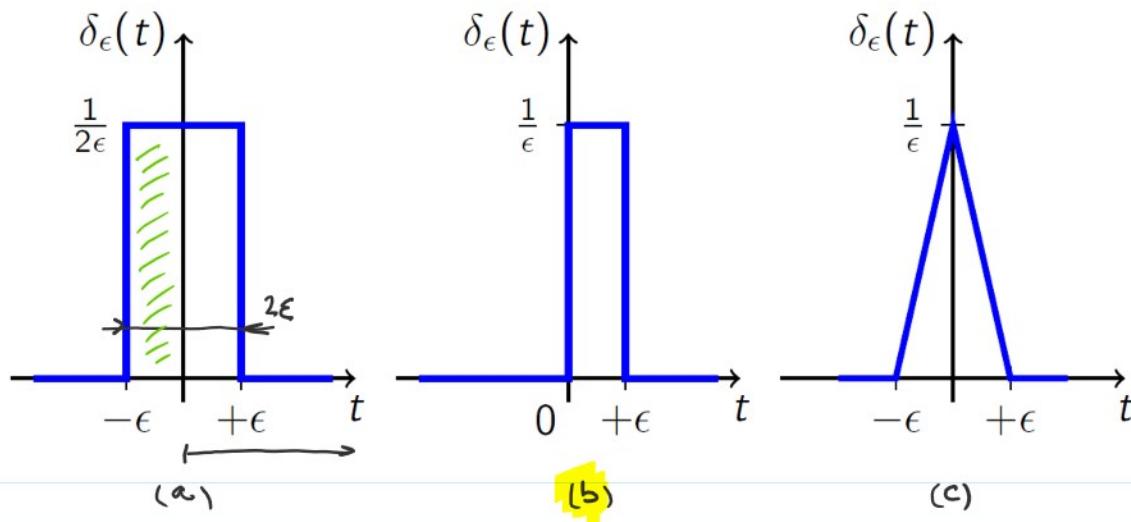
I. Diracův impulso $\delta(t)$



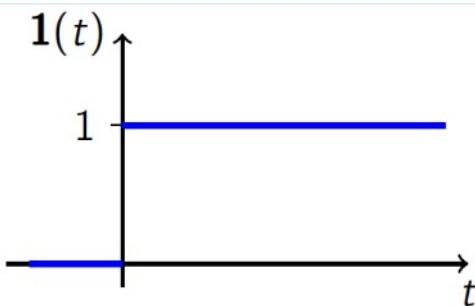
$$\int_{-\infty}^{\infty} \delta(t) dt = 1$$

$$\int_{-\epsilon}^{\epsilon} \delta(t) dt = 1$$

$$\lim_{\epsilon \rightarrow 0} \int_{-\epsilon}^{\epsilon} \delta(t) dt = 1$$



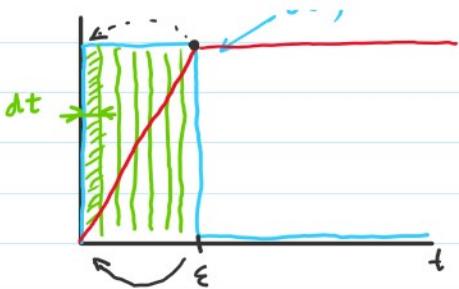
II. jednotkový skok



$$1(t) = \begin{cases} 1 & t \geq 0 \\ 0 & t < 0 \end{cases}$$



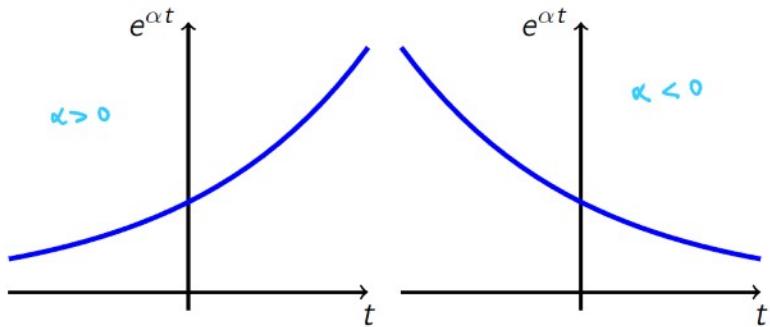
$$\lim_{\epsilon \rightarrow 0} \int_{-\epsilon}^{\epsilon} \delta(t) dt = 1$$



$$\lim_{\epsilon \rightarrow 0} \int_{-\epsilon}^{\epsilon} \delta(t) dt = 1$$

$$\mathcal{L}(t) = \int_0^\infty \delta(t) dt \quad ; \quad \delta(t) = \frac{d}{dt} \mathcal{L}(t)$$

$$f(t) = e^{\alpha t}$$



$$f(t) = A e^{\alpha t} \quad ; \quad \alpha \in \mathbb{C} \quad ; \quad \alpha = i\omega$$

$$f(t) = A \cdot e^{i\omega t} = A (\cos \omega t + i \sin \omega t)$$

a) Periodická funkce

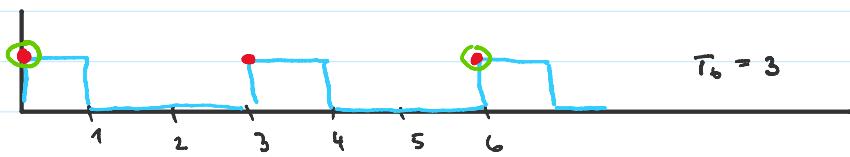
O spojitém signálu $f(t)$ říkáme, že je periodický s periodou T , jestliže

$$\forall t : f(t+T) = f(t)$$

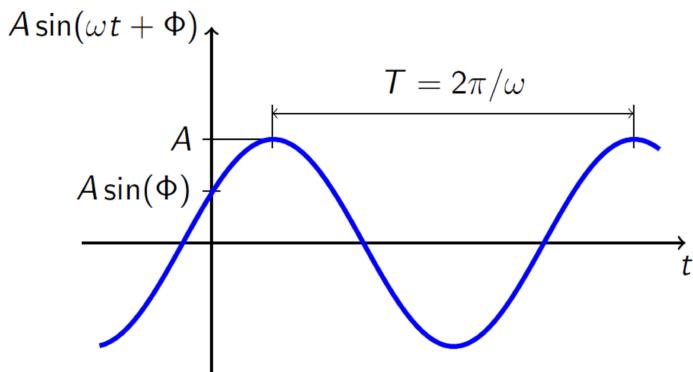
a tedy také pro libovolné $k \in \mathbb{Z}$

$$f(t) = f(t+T) = f(t+2T) = \dots = f(t+k \cdot T)$$

Nejmenší možné T nazýváme **fundamentální perioda**, značíme T_0 .

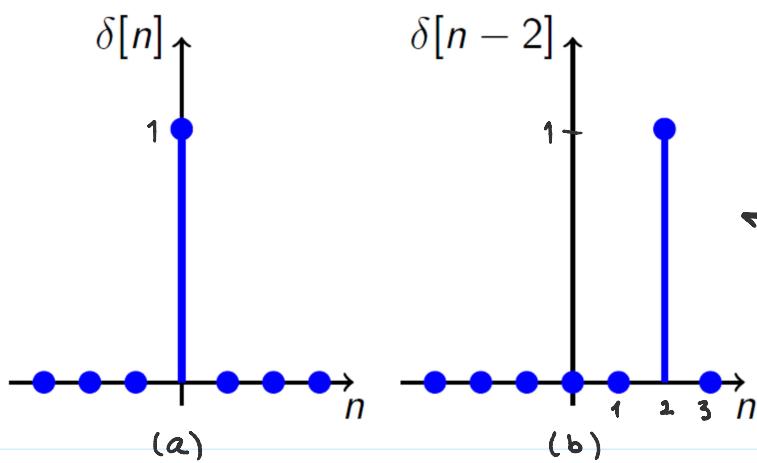


$$f(t) = A \sin(\omega t + \Phi),$$



Diskretní signály

I. Diracův impuls $\delta[n]$

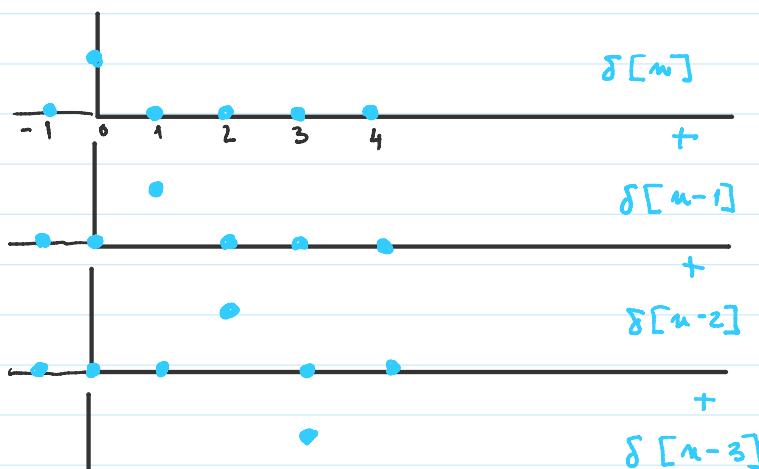


$$\delta[n] = \begin{cases} 1 & \text{if } n=0 \\ 0 & \text{if } n \neq 0 \end{cases}$$

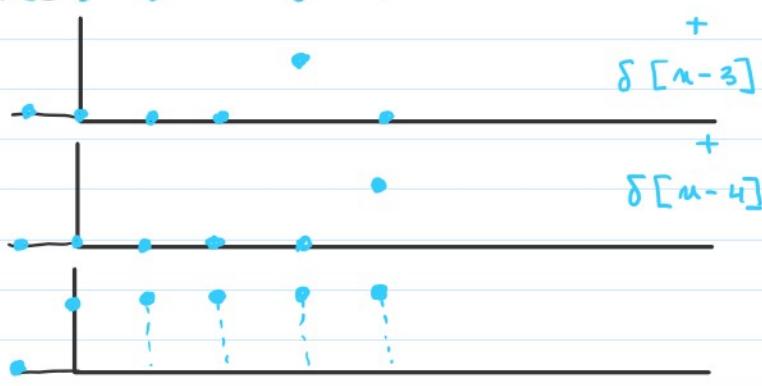
posunutý Diracův impuls

$$\delta[n-z]$$

$$\delta[n-m]$$

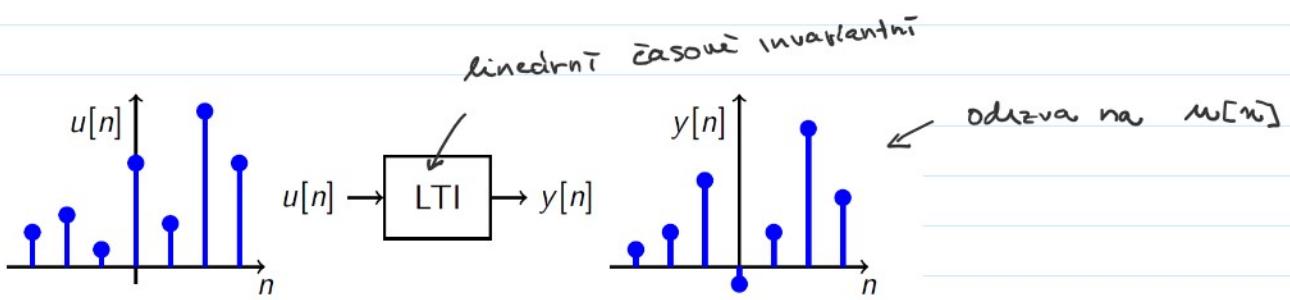


$$\delta[n] = \sum_{m=0}^n \delta[n-m]$$



II. Jednotkový skok $\mathbb{1}[n]$

$$\mathbb{1}[n] = \begin{cases} 1 & ; n \geq 0 \\ 0 & ; n < 0 \end{cases}$$



I. Impulsní odpověď $h[n]$

$$h[n] = S\{\delta[n]\}$$

$$h[n, m] = S\{\delta[m-n]\}$$

$$h[n-m]$$

II Přechodová odpověď $s[n]$

$$s[n] = S\{\sum_{m=0}^n \mathbb{1}[m]\} = S\left\{\sum_{m=0}^n \delta[m-n]\right\}$$

Linearity

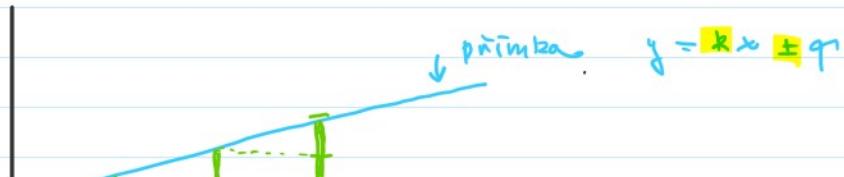
$f(x)$

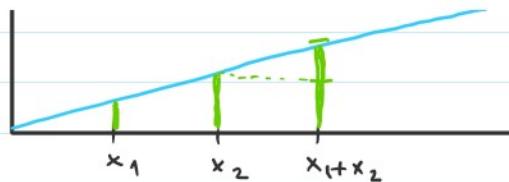
a) aditivní

$$f(x_1 + x_2) = f(x_1) + f(x_2)$$

b) homogení

$$f(\alpha \cdot x) = \alpha \cdot f(x)$$





$$y[n] + \alpha \cdot y[n-1] = u[n]$$

lineární systém

$$y[n] + \sin(n) \cdot y[n-1] = u[n]$$

zřejmě

ne-lineární

$$y[n-1] + \omega(n) y[n] = \frac{u[n]}{y[n]}$$

$$\underline{y[n]} y[n-1] + \underline{\omega(n)} \underline{y[n]} = \underline{u[n]}$$

Cesové invariance

$$y[n] + \alpha y[n-1] = u[n]$$

cesové invariantní

$$n=0: \quad y[0] + \alpha y[-1] = u[0]$$

$$n=1: \quad y[1] + \alpha y[0] = u[1]$$

$$n=2: \quad y[2] + \alpha y[1] = u[2]$$

$$y[n] + (\boxed{n \cdot}) y[n-1] = u[n]$$

$$n=0: \quad y[0] + 0 y[-1] = u[0]$$

cesové pravidlo

$$n=1: \quad y[1] + 1 y[0] = u[1]$$

$$n=2: \quad y[2] + 2 y[1] = u[2]$$

Autonomní systém



rovnice v kanonickém tvaru

$$y[n+2] + y[n-1] + \sin(n) = u[n]$$

$$y[n+2] + y[n-1] = \underbrace{u[n] - \sin(n)}_{\text{mainí vstupy}} \dots$$

$$y[n+2] + \alpha y[n-1] = \beta y[n]$$

$$y[n+2] + \alpha y[n-1] - \beta y[n] = \underline{0} \quad \text{autonomní s.}$$

$$y[n+2] + \alpha \cdot y[n-1] - \beta \cdot y[n] = \underline{0} \quad \text{autonomi s.}$$

$$y[n+2] + \alpha \cdot y[n] - \sin(n) = 0$$

$$y[n+2] + \alpha \cdot y[n] = \sin(n) \quad \text{neautonomi s.}$$