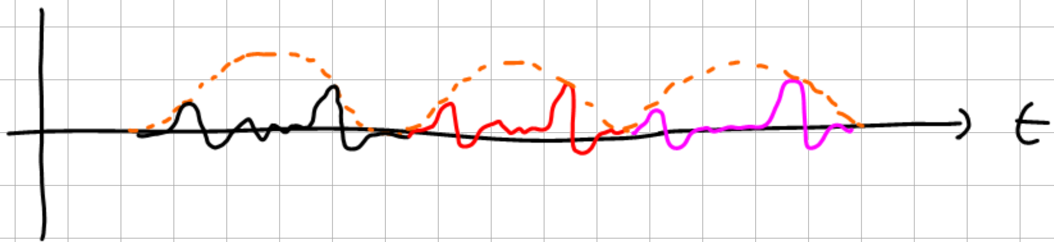
y_{Bloch}

DFT assumes periodic input signals.

Window function $\Rightarrow$ fade in fade out



new envelope of y_{Bloch} $\Rightarrow$ the periodic repetitions can have no signal jumps.

Automatic Gain Control

$$y = b \cdot x = f(x)$$

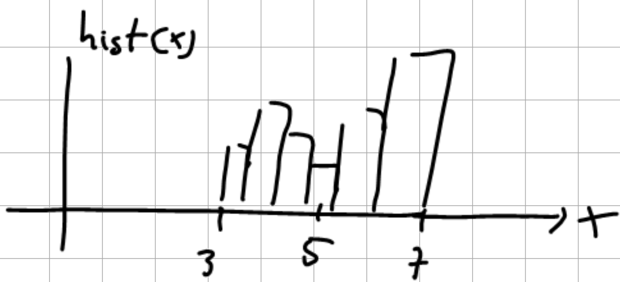
$$\& \quad \frac{1}{N} \sum_n y^2(n) = 1$$

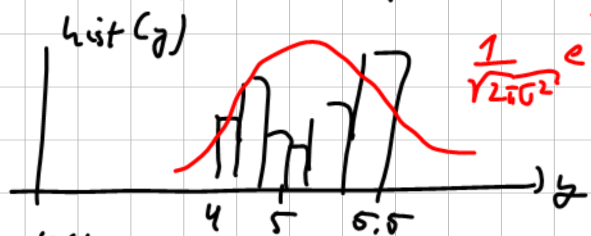
$$\vdots$$

$$b = \dots$$

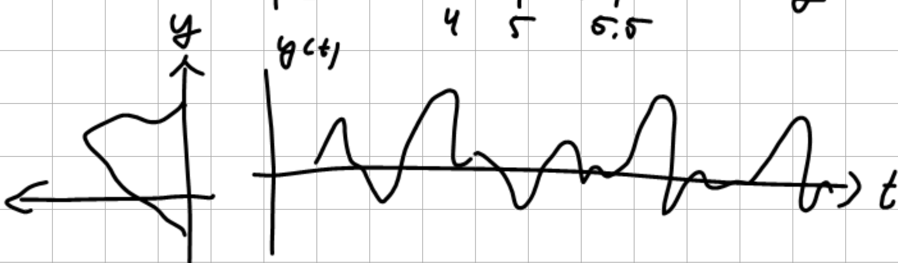
or

$$\boxed{y = b \cdot (x - a)}$$



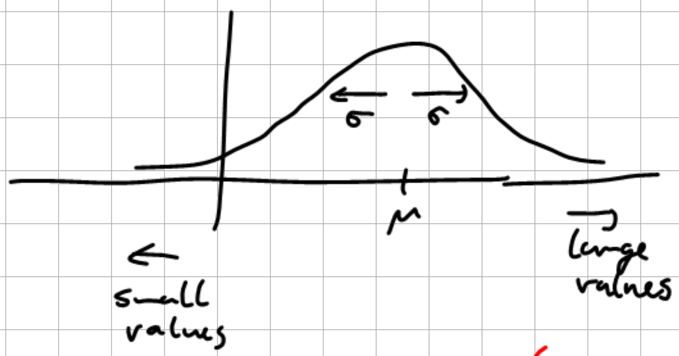


$$\frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(y-\mu)^2}{2\sigma^2}}$$



Gaussian Distr.

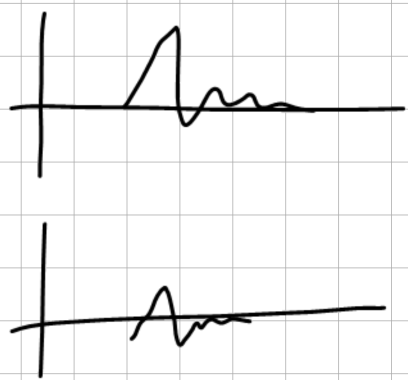
$$y = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$



both lead to small output values

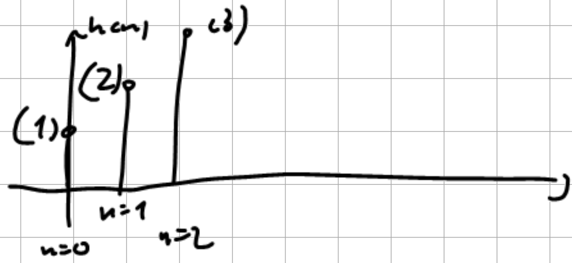
$$y = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

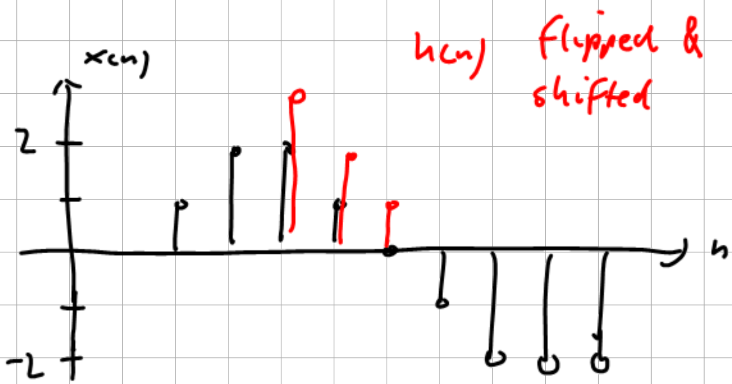
$$y = b \cdot (x \cdot a)$$

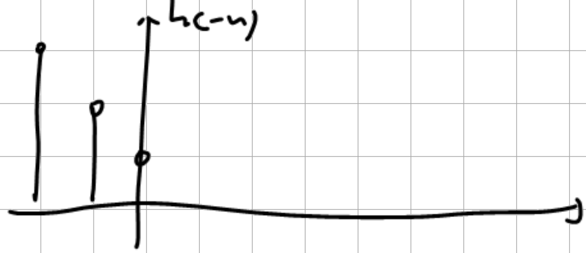


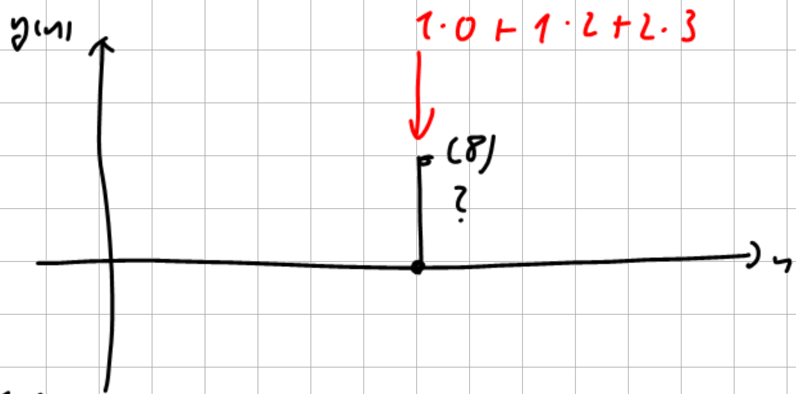
Convolution

$$y(n) = x(n) * h(n)$$









$$y(n) = x(n) * h(n) = \sum_{k=0}^{K-1} h(k) \cdot x(n-k)$$

$h(k)$ for $0 \le k < K$

$$y(n) = \sum_{k=0}^{K-1} h(k) \cdot x(n-k)$$

$$= h(0) \cdot x(n) + h(1) \cdot x(n-1) + h(2) \cdot x(n-2)$$

$$h(0) = \frac{y(n) - h(1)\, x(n-1) - h(2) \cdot x(n-2)}{x(n)}$$

$$h(0) = \frac{y(17) - h(1)\, x(16) - h(2) \cdot x(15)}{x(17)} = \frac{y(18) - h(1)\, x(17) - h(2)\, x(16)}{x(18)}$$

$$y(n) = h(0)\, x(n) + h(1)\, x(n-1) + h(2)\, x(n-2)$$

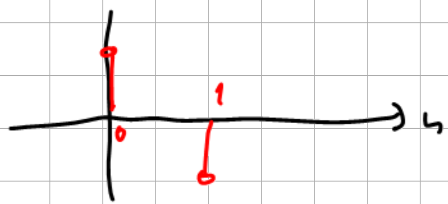
$$\begin{pmatrix} x(n) & x(n-1) & x(n-2) \end{pmatrix} \begin{pmatrix} h(0) \\ h(1) \\ h(2) \end{pmatrix} = y(n)$$

$$\begin{pmatrix} x(17) & x(16) & x(15) \\ x(18) & x(17) & x(16) \\ x(19) & x(18) & x(17) \end{pmatrix} \begin{pmatrix} h(0) \\ h(1) \\ h(2) \end{pmatrix} = \begin{pmatrix} y(17) \\ y(18) \\ y(19) \end{pmatrix}$$

Transferfunction

$$h(n) = [1 \underset{|}{,} -1]$$

$\circ\!\!-\!\!\bullet$ z-Transform



$$H(f) = \sum_{n=-\infty}^{\infty} h(n) \cdot e^{-j2\pi f t} \qquad t = n \cdot T = \frac{n}{r}$$

$$= \sum_{n=-\infty}^{\infty} h(n)\, e^{-j2\pi f \frac{n}{r}} \qquad r = 48\ \text{kHz}$$

$$= h(0)\, e^{-j2\pi f \frac{0}{r}} + h(1)\, e^{-j2\pi f \frac{1}{r}}$$

$$= e^{-j2\pi f \frac{0}{r}} - e^{-j2\pi f \frac{1}{r}}$$

$$= 1 - e^{-j2\pi f/r} = 1 - \cos(+2\pi f/r) + j\sin(+2\pi f/r)$$

$$|H(f)| = \sqrt{\left(1 - \cos\left(2\pi \frac{f}{r}\right)\right)^2 + \sin^2(2\pi f/r)}$$

$$= \sqrt{1 - 2\cos\left(2\pi \frac{f}{r}\right) + \cos^2\left(2\pi \frac{f}{r}\right) + \sin^2\left(2\pi \frac{f}{r}\right)}$$

$$= \sqrt{2 - 2\cos\left(2\pi \frac{f}{r}\right)}$$

$$|H(f)| = \sqrt{2 - 2\cos(2\pi \frac{f}{r})}$$

Highpass

$$|H(0)| = \sqrt{2 - 2\cos(0)} = 0$$

$$|H(\frac{r}{2})| = \sqrt{2 - 2\cos(\pi)} = \sqrt{4} = 2$$