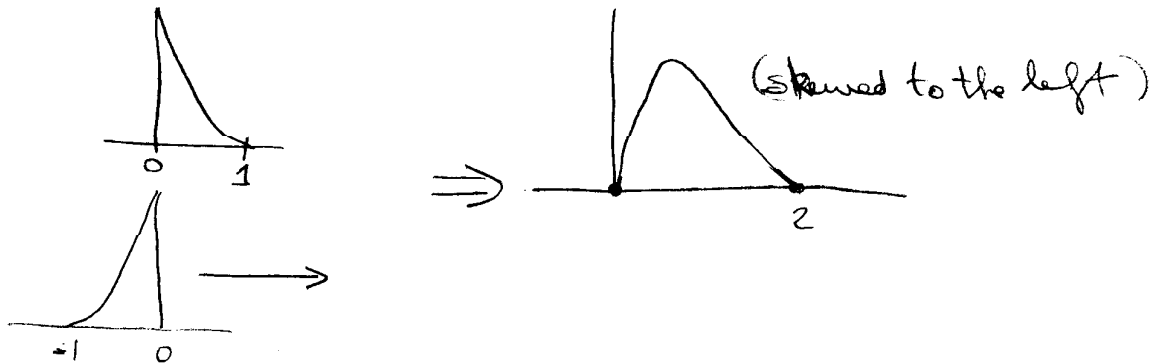


Quiz #2 - Solution

1. We know that $\int_{-\infty}^{\infty} f(t) \delta(at-b) dt = \frac{1}{|a|} f(b/a)$

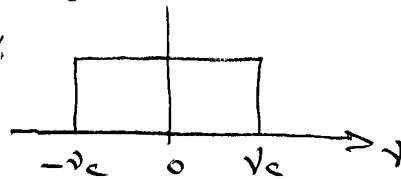
$$\begin{aligned} \therefore \int_{-\infty}^{\infty} \delta(-2t-1) \cos(\pi vt) dt &= \frac{1}{|-2|} \cos\left(\frac{\pi v(+1)}{-2}\right) \\ &= \frac{1}{2} \cos\left(-\frac{\pi v}{2}\right) = \frac{1}{2} \cos\frac{\pi v}{2} \end{aligned}$$

2. Flip one of the functions and slide:

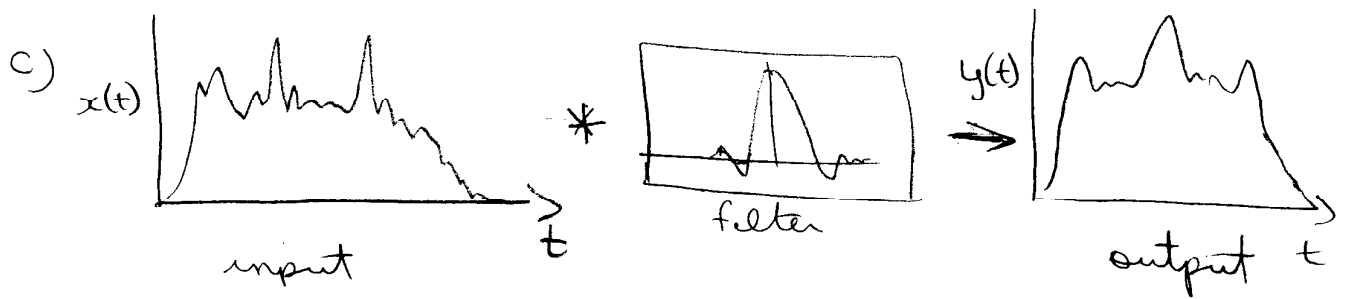


3. a) If Autocorrelation = δ , then the signal must be white noise (i.e. random, no correlation in one part of the signal compared to another part).
 b) See notes - page 6-5b for example.

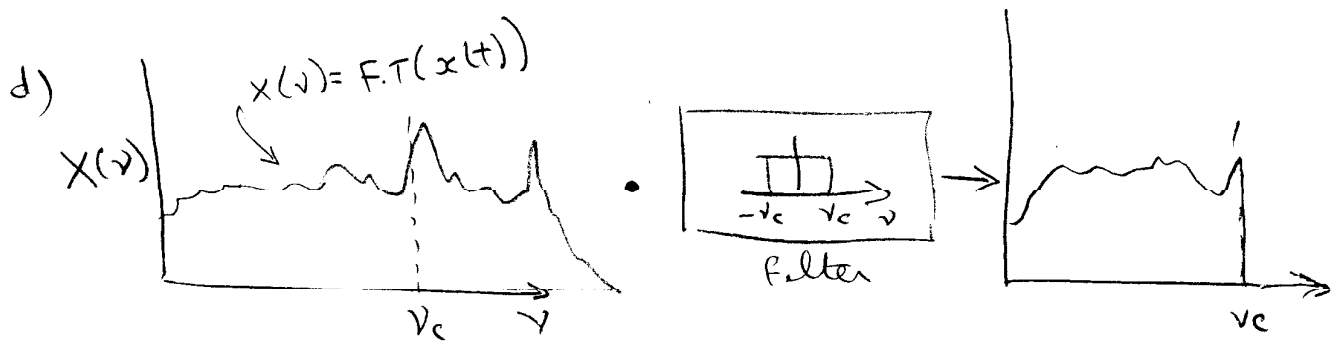
4. a) Low pass filter:
 in ν space



$$\begin{aligned} \text{b) In time space: } 2\nu_c \text{sinc}(2\pi\nu_c t) &\Leftrightarrow \Pi_{2\nu_c}(t) \\ \text{(from } a \text{sinc}(\pi\nu a) &\Leftrightarrow \Pi_a(t)) \end{aligned}$$



The signal is smoothed, i.e. loses its high frequency component. The process is a convolution.



The frequencies $> \nu_c$ are eliminated.
The process is a multiplication.