

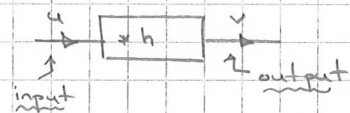
(FT) Bonus points for the exam in MMA710

A linear time-invariant system (LTI) is a relation between an input signal u (assumed continuous) and an output signal v () of the form

$$v = h * u \quad (\text{LTI-equation})$$

where h is assumed continuous + (abs. integrable) (BIBO-stability) (+real-valued) often called impulse response, and uniquely determines the LTI-system.

"Block presentation"



1) Consider a LTI-system $v = h * u$.

a) Can the input $u(x) = \cos x$ generate the output $v(x) = \sin 2x$? (1p)

b) If $h(x) = e^{-\pi x^2}$ and $v(x) = \sin 2x$, what must the input u have been? (3p)

2) Consider a LTI-system $v = h * u$.

If the input $u_1(x) = e^{-2\pi|x|}$ generates the output $v_1(x) = e^{-\pi x^2}$,

which output does then the input $u_2(x) = e^{-\pi x^2}$ generate? (6p)

3) Consider the LTI-system with $h(x) = \begin{cases} 1/4 & x=0 \\ (\frac{\sin(\pi x/2)}{\pi x})^2 & x \neq 0 \end{cases}$

If $u(x) = \sum_{n=-\infty}^{\infty} e^{-(x+n)^2}$, what is v ? (4p)

Total 14p

Good Luck!

1 Bonus pt. 6-10 pts

2 Bonus pts 11-14 pts

Hand in before = October 11, at 12⁰⁰ (noon!)
(Thursday)