A 2.1

(a) $y[n] = x[n] - x[n-1]$

Linearität: „Testsignal" $x[n] = a \cdot x_1[n] + b x_2[n]$ (Homogenität, Additivität)

$\Rightarrow y[n] = a x_1[n] + b x_2[n] - \left(a x_1[n-1] + b x_2[n-1]\right) =$

$= a \left(x_1[n] - x_1[n-1]\right) + b \left(x_2[n] - x_2[n-1]\right) =$

$= a \quad y_1[n] \quad + b \quad y_2[n]$ ✓

Zeitinvarianz: n_0

$y[n-n_0] = x[n-n_0] - x[n-n_0-1]$

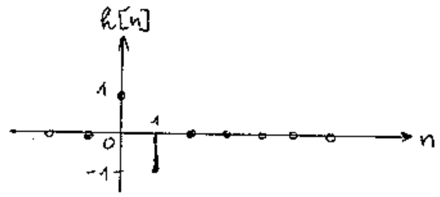
$n - n_0 = m$

$y[m] = x[m] - x[m-1]$

$m \mapsto n$

$y[n] = x[n] - x[n-1]$ ✓

$\Rightarrow$ LTI: $h[n] = \delta[n] - \delta[n-1]$



Kausalität:

$h[n] = 0 \mid n < 0$ ✓

Stabilität (BIBO): $|x[n]| \leq M_1 < \infty \quad \forall n$

$|y[n]| = |x[n] - x[n-1]| \leq |x[n]| + |x[n-1]| \leq 2 M_1 = M_2 < \infty$ ✓

A 2.1

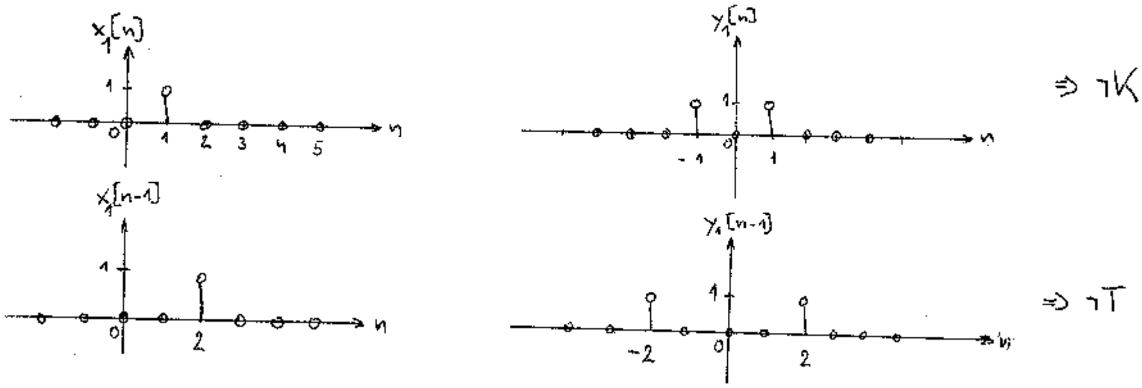
(c) $y[n] = \sum_{k=n-2}^{n+4} x[n] = \sum_{k=-4}^{2} x[n-k]$

$L, T \Rightarrow LTI : h[n] = \sum_{k=-4}^{2} \delta[n-k]$

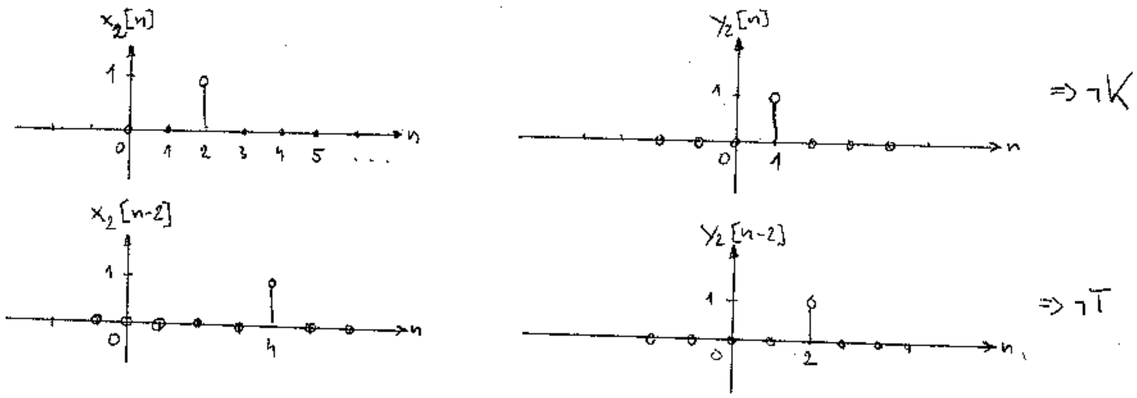
$h[n] \neq 0 \mid n < 0 \Rightarrow \neg K$

$|y[n]| \leq 7M_1 < \infty \Rightarrow$ BIBO

(d) L, ¬T, ¬K, BIBO



(e) L, ¬T, ¬K, BIBO



A 2.1

(f) $L, \neg T, K, BIBO$

$$y[n-n_0] = \frac{1}{n+0,5} \cdot x[n-n_0]$$

$n-n_0 = m, \quad n = m+n_0$

$$y[m] = \frac{1}{m+n_0+0,5} x[m]$$

$m \mapsto n$

$$y[n] = \frac{1}{n+0,5+n_0} x[n] \quad \Rightarrow \quad \neg T$$

(g) $L, T, \neg K, BIBO$

$$\Rightarrow h[n] = -\delta[n+1] + \delta[n] + \delta[n-1]$$

$$h[n] \neq 0 \; \big| \; n < 0 \quad \Rightarrow \neg K$$