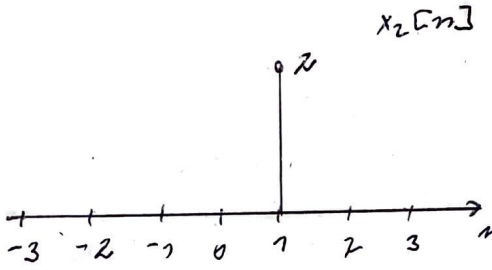
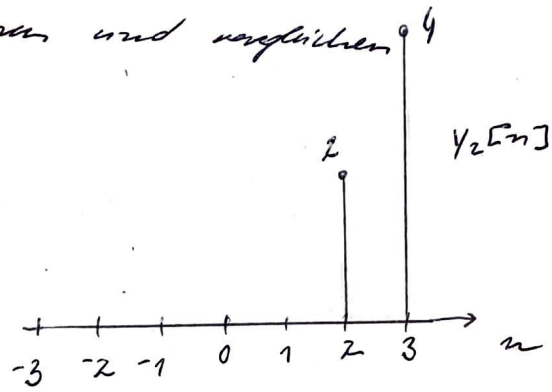
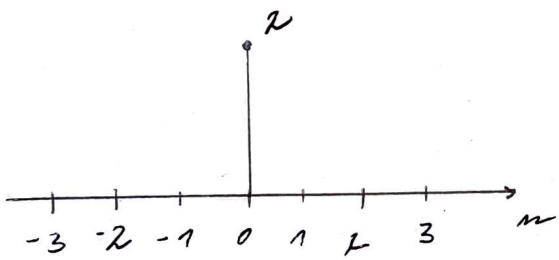
Aufgabe 3.

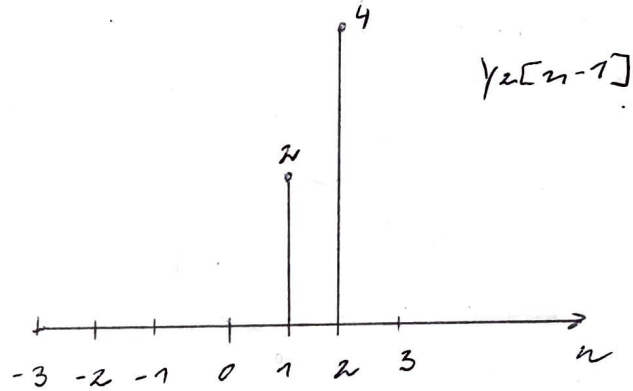
Impulsantwort berechnen und zeichnen





Verschiebung möglich (zeitinvariant)

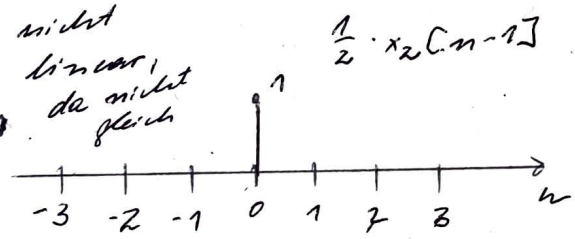


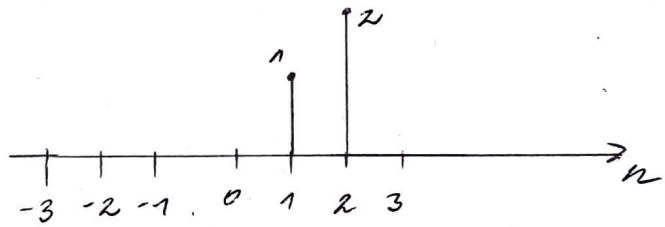


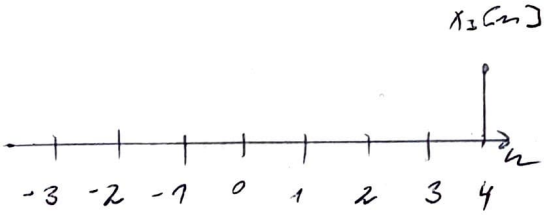
Skalierung (Skalierbarkeit, wenn LTI)

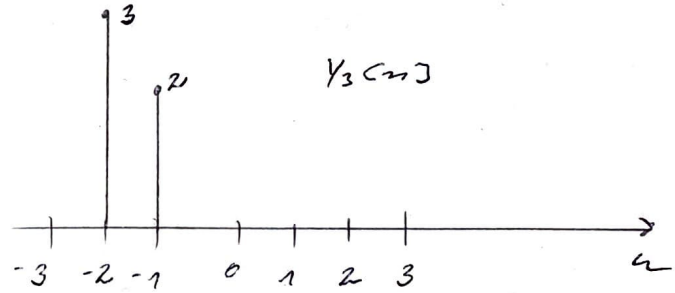
$\frac{1}{2} \cdot y_2[n-1] = h[n]$

≠ nicht linear, da nicht gleich

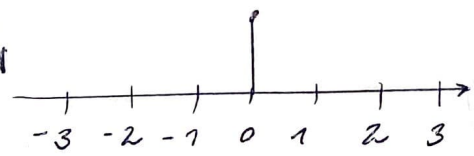


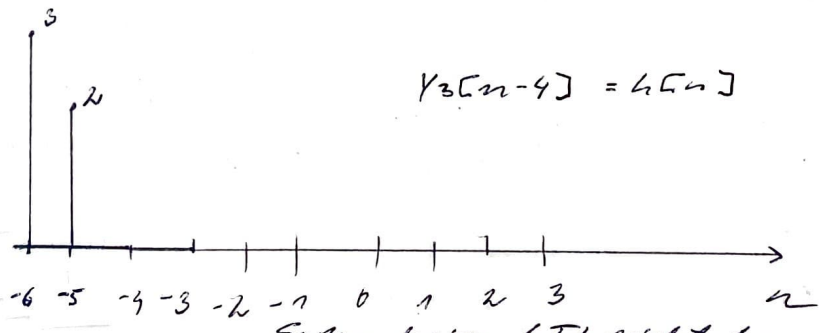






Verschiebung



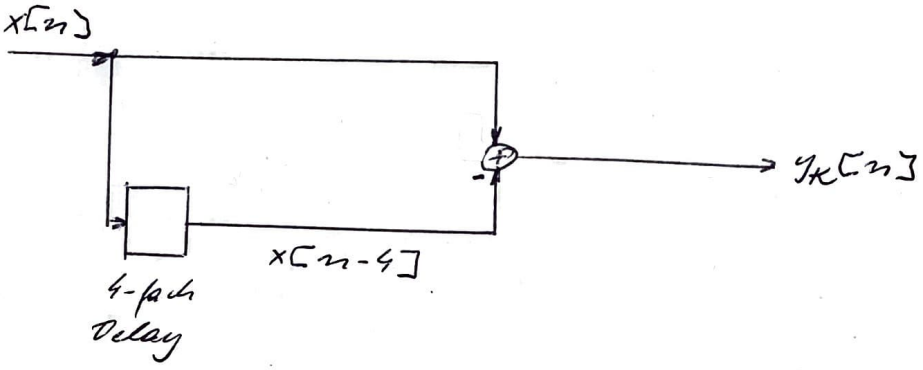


System beim LTI, nicht linear

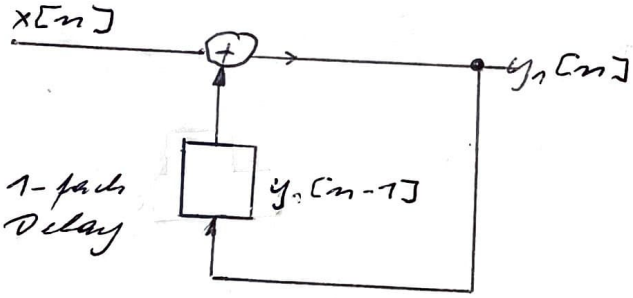
Aufgabe 4

i.)

a. Kammfilter: $y_K[n] = x[n] - x[n-4]$



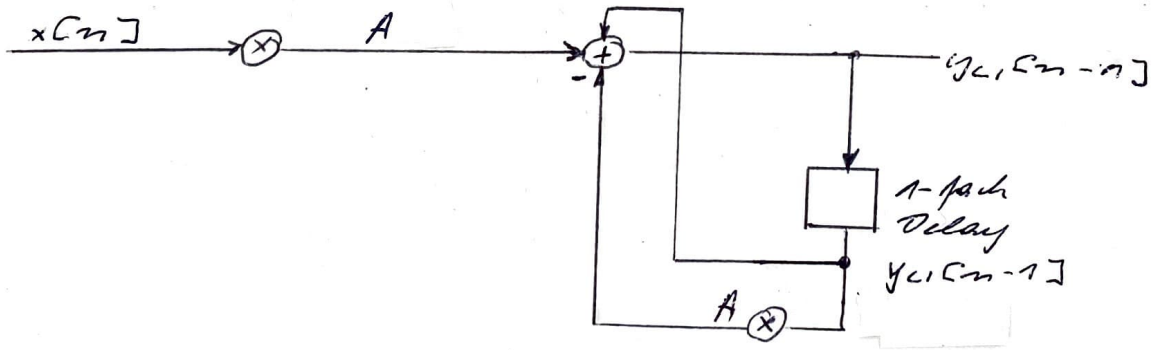
b. Integrator: $y_1[n] = x[n] + y_1[n-1]$



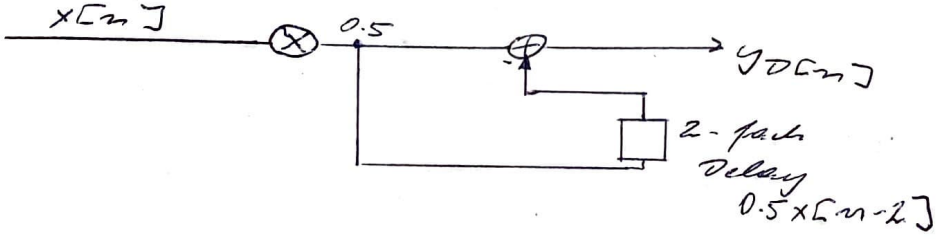
c. Leaky Integrator: $y_{L1}[n] = Ax[n] + (1-A)y_{L1}[n-1]$

wobei A zw. 0 und 1

$y_{L1}[n] = Ax[n] + y_{L1}[n-1] - A \cdot y_{L1}[n-1]$



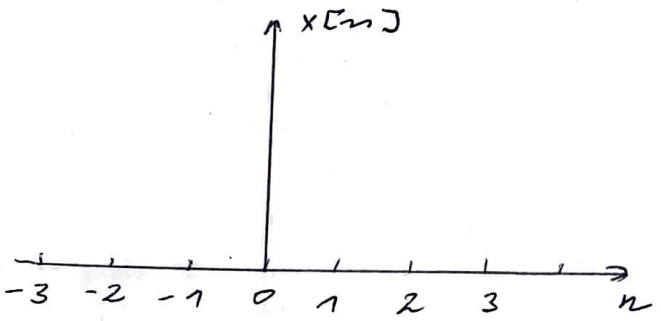
d. Differenzierer: $y_D[n] = 0.5x[n] - 0.5x[n-2]$



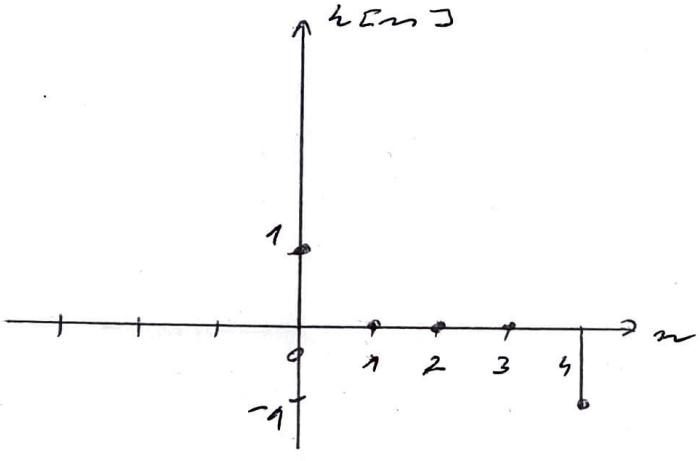
ii)

$h[n]$ SI (kanale sistemi) (A=0.5)

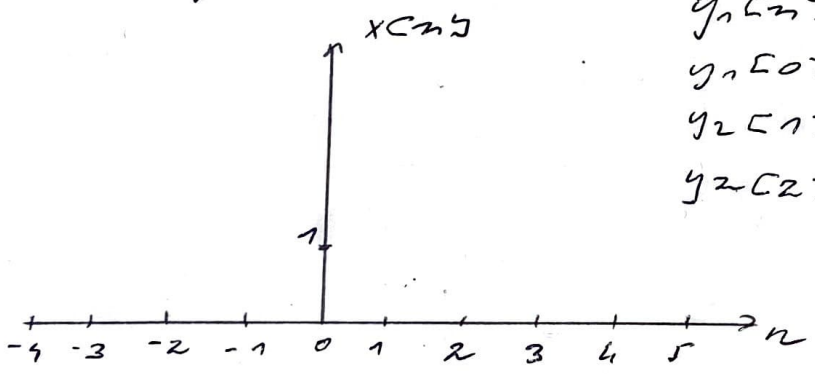
Kamm filter



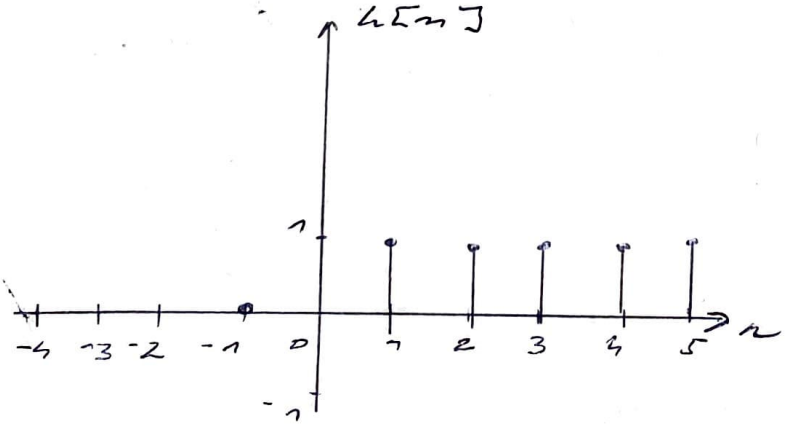
$$y_k[n] = x[n] - x[n-4]$$
$$y_k[0] = x[0] - x[0-4]$$
$$1 - 0$$



Integrator



$$y_1[n] = x[n] + y[n-1]$$
$$y_1[0] = x[0] + y[0-1]$$
$$y_2[1] = x[1] + y[1-1]$$
$$y_2[2] = x[2] + y[2-1]$$
$$\vdots$$



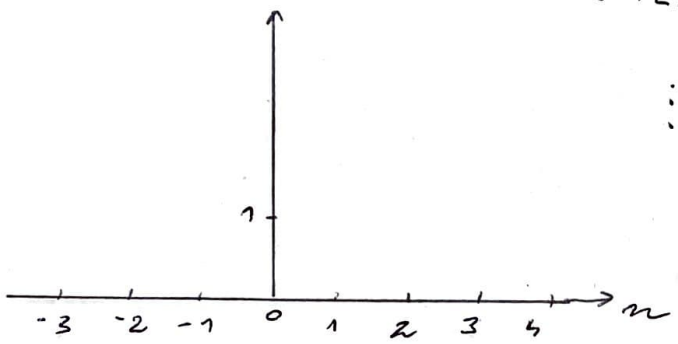
leaky Integrator $A = 0.5$ $y_{LI}[n] = A x[n] + (1-A) y_{LI}[n-1]$

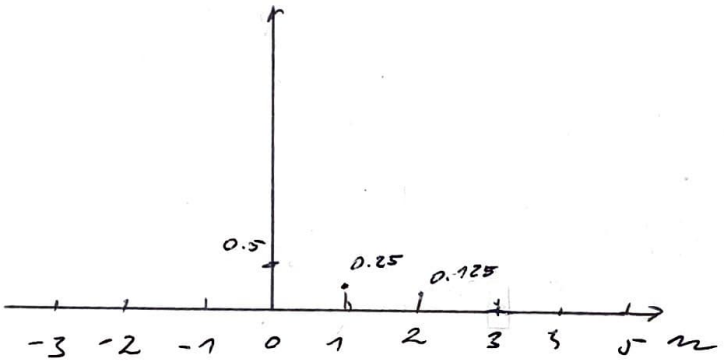
$y_{LI}[0] = 0.5 x[0] + 0.5 \cdot y_{LI}[0-1]$
$0.5 \quad + \quad 0.5 \cdot 0$

$y_{LI}[1] = 0.5 x[1] + 0.5 y_{LI}[0]$
$0.5 \cdot 0 \quad + \quad 0.25$

$y_{LI}[2] = 0.5 x[2] + 0.5 y_{LI}[1]$
$0 \quad + \quad 0.5 \cdot 0.25$

$\vdots$





Differenzierer

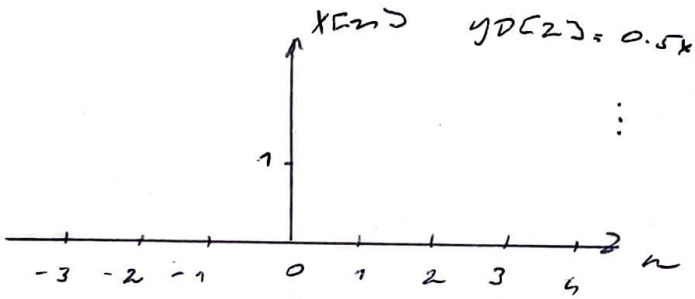
$y_D[n] = 0.5 x[n] - 0.5 x[n-2]$

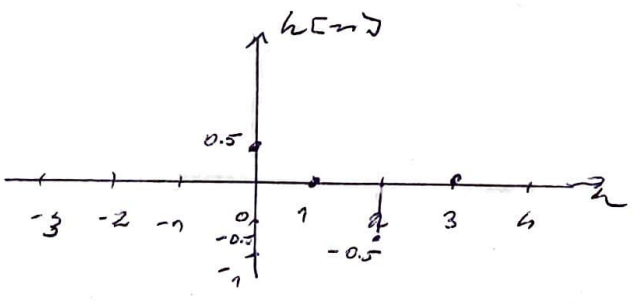
$y_D[0] = 0.5 x[0] - 0.5 x[0-2]$
$0.5 \quad - \quad 0$

$y_D[1] = 0.5 x[1] - 0.5 x[-1]$
$0 \quad - \quad 0$

$y_D[2] = 0.5 x[2] - 0.5 x[0]$
$0 \quad - \quad 0.5$

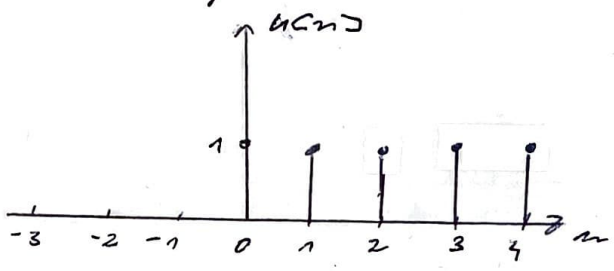
$\vdots$

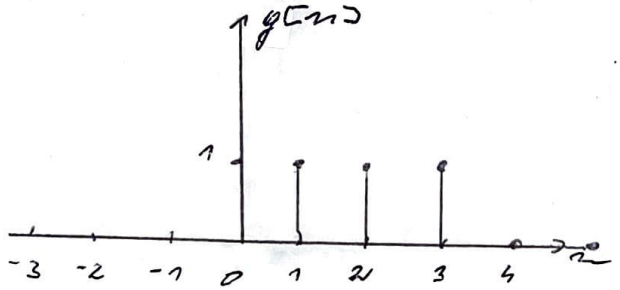




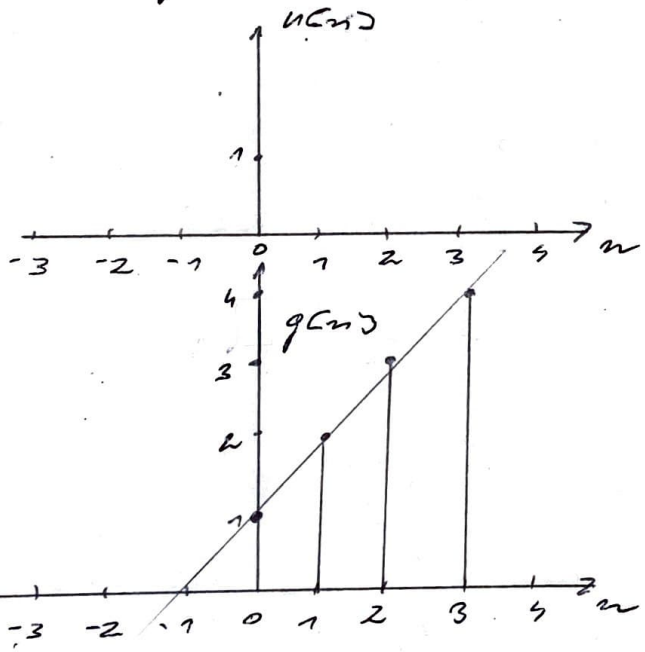
iii.)

Kammfilter

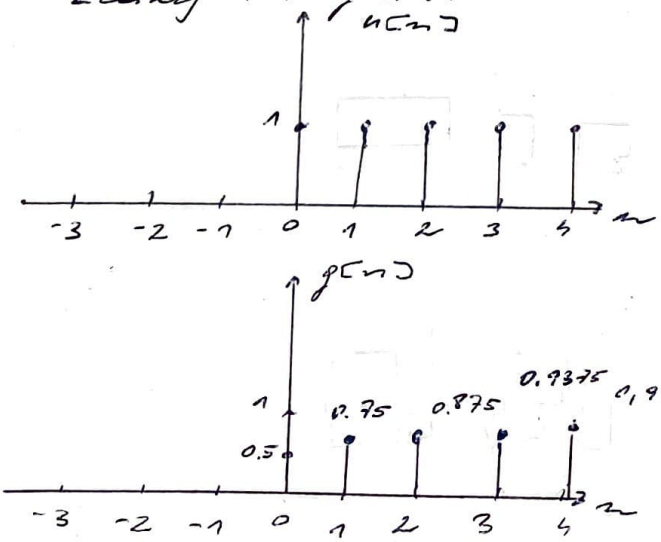




Integrator



Leaky Integrator



Differenziator