

1) GİRİŞİ $x[n]$, ÇIKIŞI $y[n]$ OLAN AYRIK ZAMAN BİR SİSTEM AŞAĞIDAKİ GİBİ TANIMLANMAKTADIR.

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

Buna göre;

a) Zamanla değişim değişmediğini gösteriniz.

b) Nedensel olup olmadığını gösteriniz.

a)

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

$$y_1[n] = x_1[n+1] - x_1[n-1]$$

$$x_2[n] = x_1[n-n_0] \text{ olsun;}$$

$$x_2[n] = y_2[n] = x_2[n+1] - x_2[n-1]$$

$$x_2[n] = y_2[n] = x_1[n-n_0+1] - x_1[n-n_0-1]$$

$$x_1[n-n_0] y_2[n] = y_1[n-n_0] \rightarrow \text{olduğu için sistem zamanla değişmez.}$$

b)

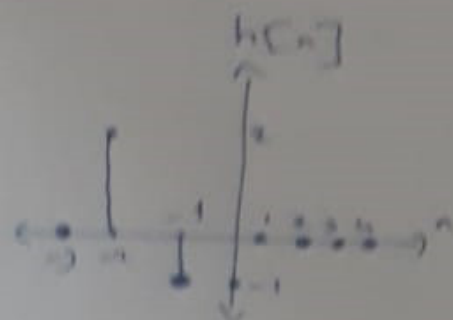
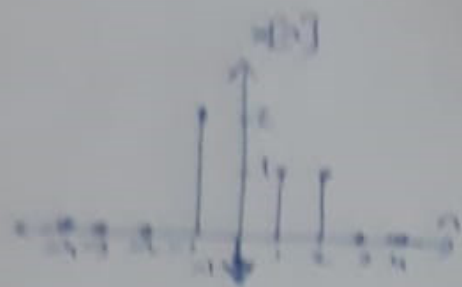
$$y[n] = x[n+1] - x[n-1]$$

Gelecekte
Zaman

Gecmiş
Zaman Sinyali

\Rightarrow Sistem gelecekte zaman sinyaline bağlı olduğu için nedensel değildir.

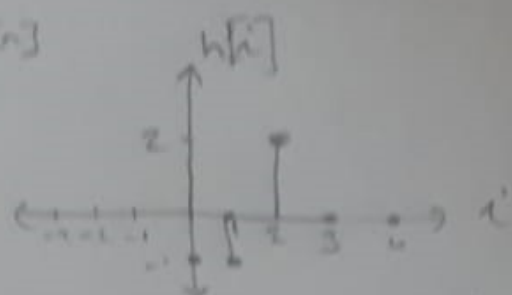
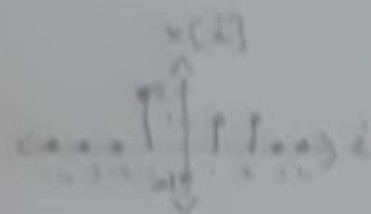
2) Angenommen werden $x[n]$ und $h[n]$ digitale Sinus-Signale sein
 $y[n] = x[n] * h[n]$ konvolutionsplan implementierte Gesamtsysteme $y[n]$ ableiten.



$$x[n] * h[n] \rightarrow y[n] \quad y[n] = x[n] * h[n]$$

$h[n]$ ist ein 3er Filter, daher müssen wir $x[n]$ um 3 Stellen verschieben

$$y[n] = \sum_{k=-\infty}^{\infty} x[k] h[n-k] \quad x[n] * h[n]$$



$$n=2 \rightarrow 1$$

$$n < -3 \text{ ist } 0$$

$$y[n] = 0$$

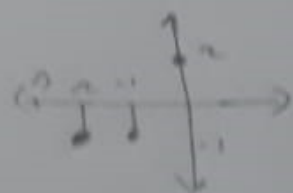
$$n = -3 \text{ ist } (3 \text{ Stellen nach})$$

$$n = -2 \text{ ist } (2 \text{ Stellen nach})$$



$$y[-2] = 2 \cdot 2 = 4$$

$$y[-2] = 4$$

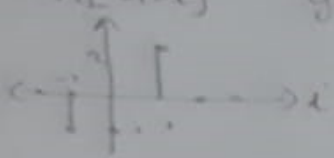


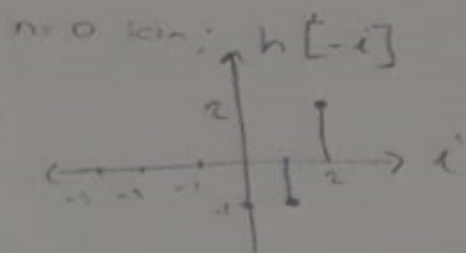
$$y[-2] = (-1 \cdot 2) + (-1) = -2$$

$$y[-2] = -2 \cdot (-2) = 4$$

$$y[-2] = -4$$

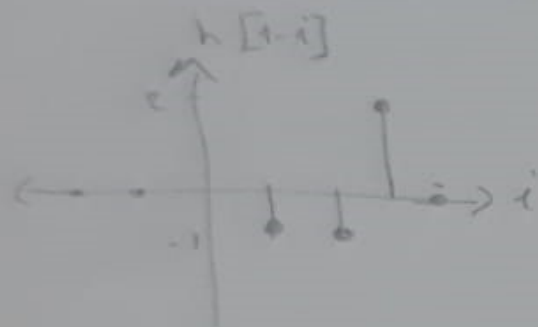
$n = -1$ von (1. binom. Satz);

$$h[-1-i] \quad y[-1] = (-1 \cdot 2) + (1 \cdot 1) + (2 \cdot 1) \\ = -2 + 1 + 2 \\ = 1$$




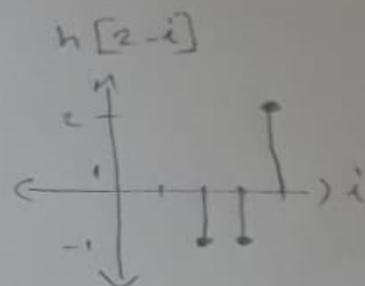
$$y[0] = (-1 \cdot 1) + (1 \cdot -1) + (1 \cdot 2) \\ = 1 - 1 + 2 \\ = 2$$

$n = 1$ von (1. binom. Satz);



$$y[1] = (-1 \cdot 1) + (-1 \cdot 1) \\ = -2$$

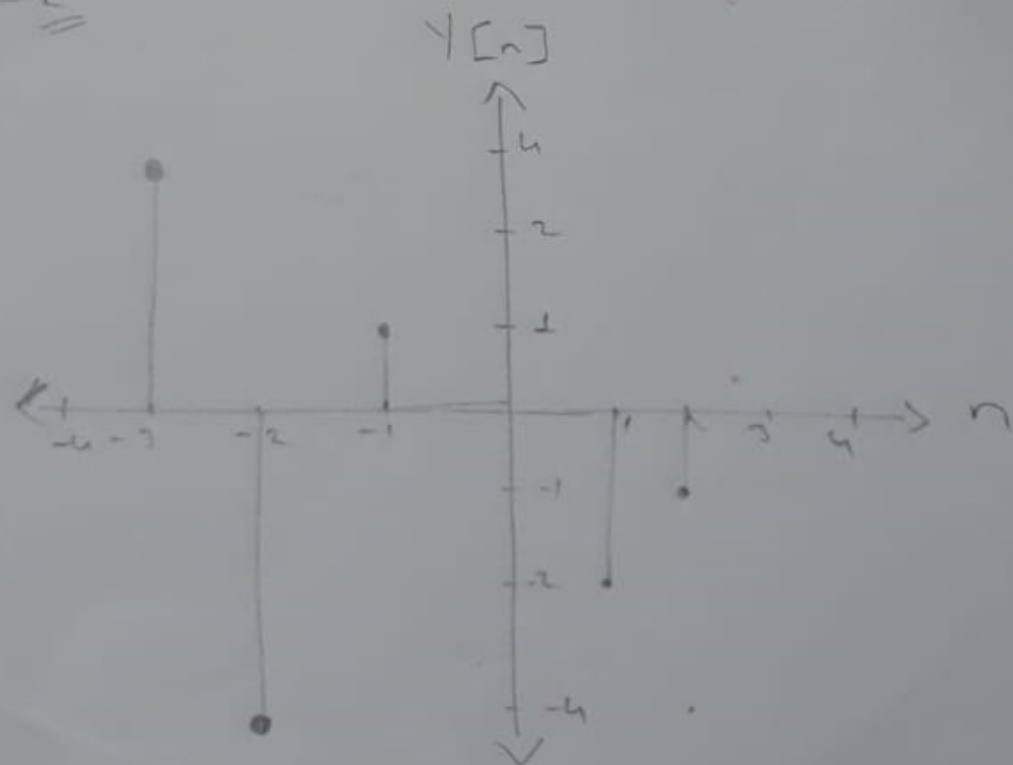
$n = 2$ von;



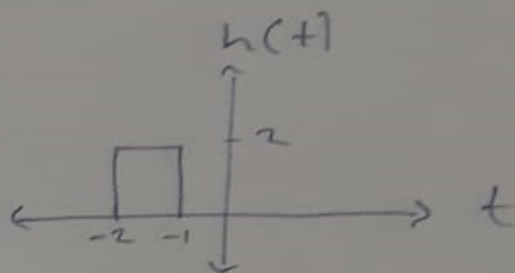
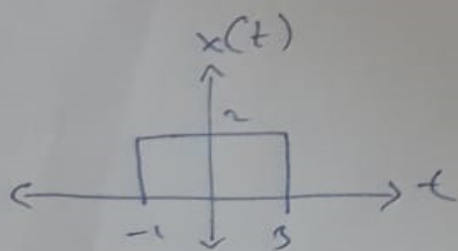
$$y[2] = (1 \cdot -1) \\ = -1$$

$n > 2$ von
von 1. binom.

$F_y[n] = 0$



3) Aşağıda verilen $x(t)$ ve $h(t)$ sürekli zaman sinyalleri için $y(t) = x(t) * h(t)$ konvolüsyon işlemini gerçekleştirilerek $y(t)$ 'yi çiziniz.



$t < -1$ örtüşme yok $\rightarrow y(t) = 0$ 1. bölge

$-1 \leq t \leq 0$ bazı değerler örtüşüyor.

$$\int_{-1}^t 2 \, dt = [2t]_{-1}^t = 2t - (-2) = 2t + 2$$

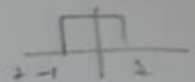


2. bölge



$0 < t < 3$ tüm değerler

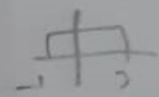
$$\int_{-1}^3 2 \, dt = [2t]_{-1}^3 = 2(3) - 2(-1) = 6 + 2 = 8$$



$$= 2t - (2t - 4) = 2t - 2t + 4 = 4$$

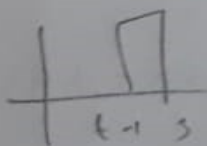
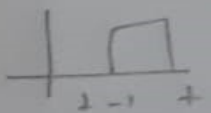
3. bölge

$3 \leq t < 4$ bazı değerler



$$\int_{-1}^3 2 \, dt = [2t]_{-1}^3 = 2(3) - 2(-1) = 6 + 2 = 8$$

$$12 - (2t - 4) = 12 - 2t + 4 = 16 - 2t$$



4. bölge

