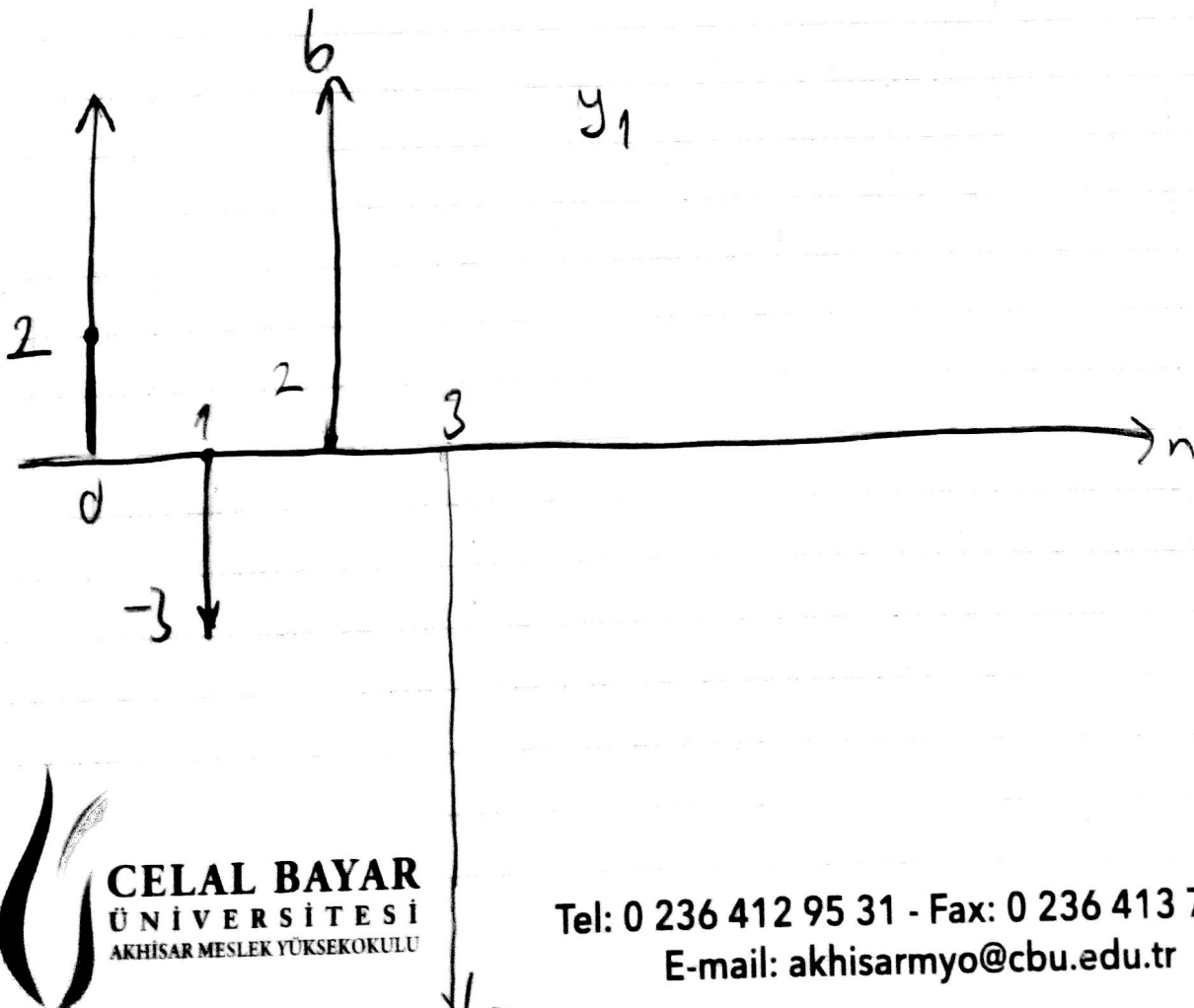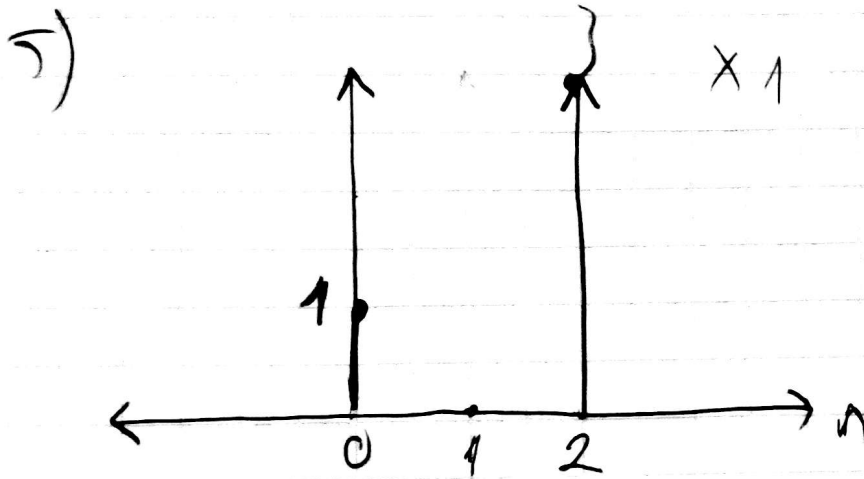4) Definition of radian = $\dfrac{radius}{circumference} = \dfrac{length}{length}$

Which leads to a dimesionless measure

Degree is equal to 0.0174_ radians.

Which is dimensionless as well.

5)

multiplying sides with $e^{j(2\pi t_c)\ell t}$

b_{n-c}

b)

$$X_1[N] = \delta[n] + 3\delta[n-2]$$

$$X_2[N] = 2\delta[n] - 3\delta[n-1] + 2\delta[n-2] - 9\delta[n-3] - 12\delta[n-4]$$

$$X_2[N] = a_1 X_1[n-n_1] + a_2 x_1[n-n_2] + a_3 x_1[n-n_3]$$

$$a_1 = -3 \qquad a_2 = 2 \qquad a_3 = -4$$

$$n_1 = n-1 \qquad n_2 = n \qquad n_3 = n-2$$

5c)

$$x_2[N] = -3x_1[n-1] + 2x_1[n] - 4x_1[n-2]$$

$$x_1[N] \longrightarrow \boxed{\text{System}} \xrightarrow{\ y_1[N]\ }$$
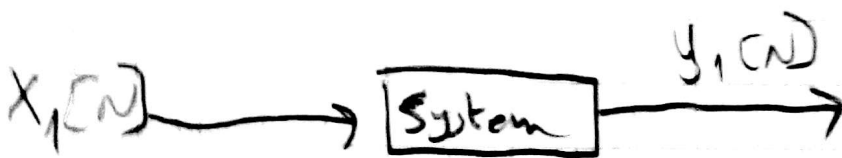
$$y_2[N] = -3y_1[n-1] + 2y_1[n] - 4y_1[n-2]$$

$$-3y_1[n-1] = -6\delta[n-1] + 2\delta[n-2] - 18\delta[n-3] + 27\delta[n-4]$$

$$2y_1[n] = 4\delta[n] - 6\delta[n-1] + 42\delta[n-2] - 18\delta[n-3]$$

$$-4y_1[n-2] = -8\delta[n-2] + 12\delta[n-3] - 24\delta[n-4] + 36\delta[n-5]$$

5d)

$$y, \check{y}^{N]}$$

$$2\delta[n] - 3\delta[n-1] + 6\delta[n-2] - 9\delta[n-3] = \sum h[k] \cdot r[n-k]$$

$$h[n] = 2\delta[n] - 3\delta[n-1]$$

5e) $$h[n] * x[n] = y[n]$$

h[n]

X₂[n]

$y_i[n]$

$$2\delta[n] - 3\delta[n-1] + 6\delta[n-2] - 9\delta[n-3] = \sum h[k] \cdot x[n-k]$$

$$h[n] = 2\delta[n] - 3\delta[n-1]$$
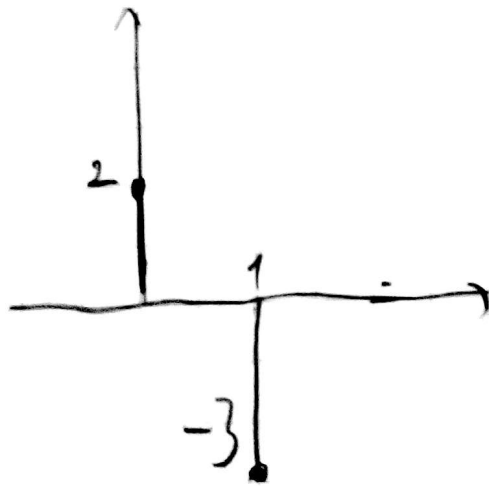
5e) $h[n] * x[n] = y[n]$

$h[n]$

$x_2[n]$
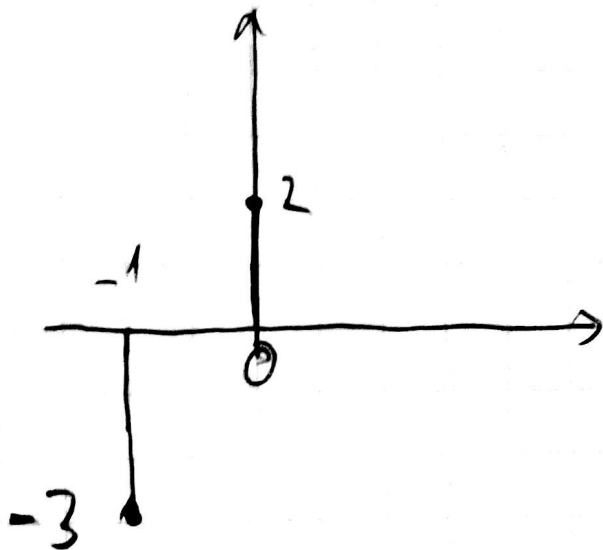
$$y[0] = \sum_{k=-1}^{\infty} x[k] \cdot h[-k]$$
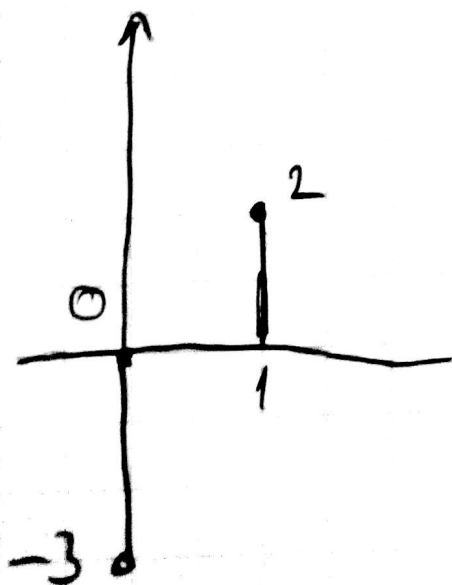
$h[-n]$

$$y[0] = 4$$

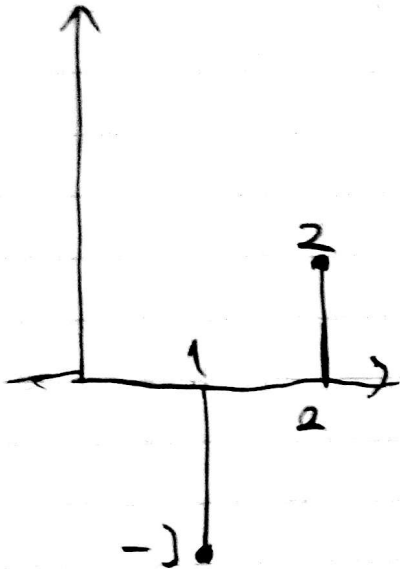$$y[4] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[1-k]$$
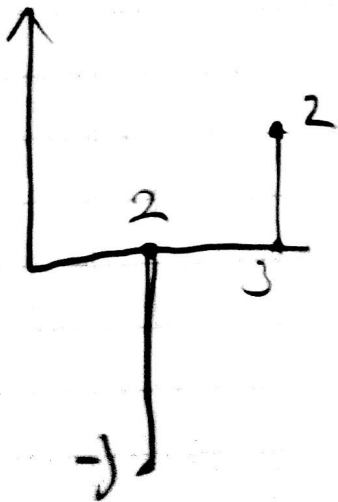
$h[1-n]$

$$y[1] = -8 - 6$$

$$y[2] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[2-k]$$

$h[2-n]$

$$y[2] = 9 + 4$$

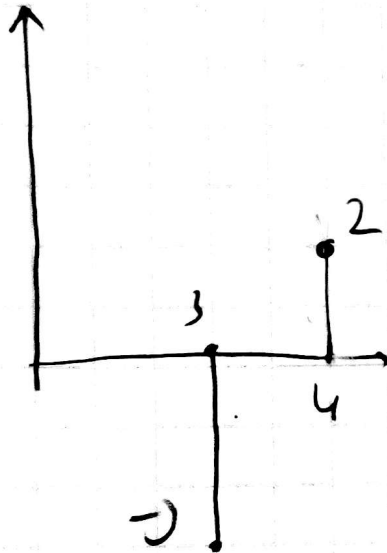$$y[3] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[3-k]$$

$$y[3] = -6 - 18$$

$$y[2] = \sum x[k] \cdot h[2-k]$$
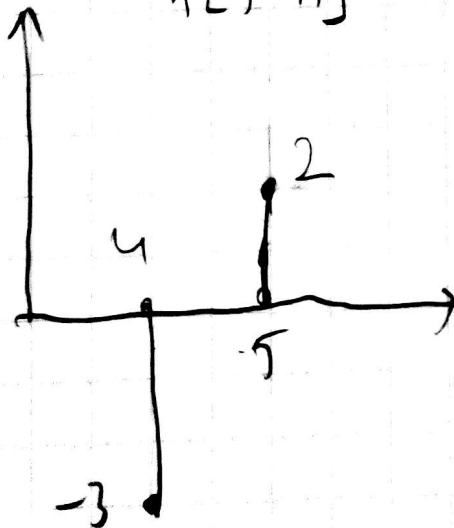
$$y[4] = \sum_{k=0}^{\infty} x[k] \cdot h[4-k]$$

$h[4-n]$

$$y[4] = 27 - 24$$

$$y[5] = \sum_{k=0}^{\infty} x[k] \cdot h[5-k]$$

$h[5-n]$

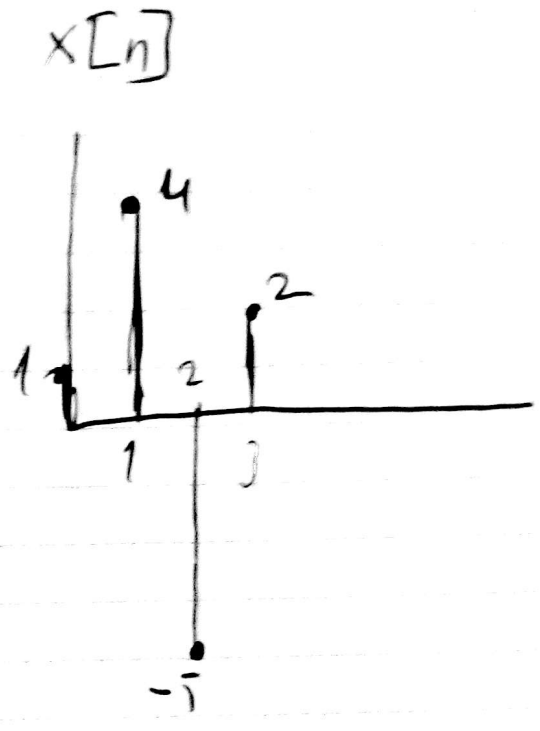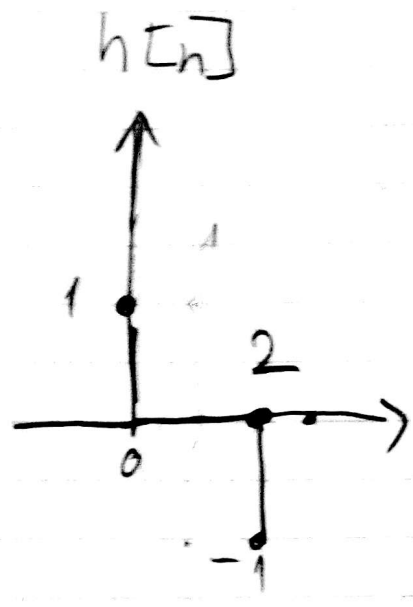$$y[5] = 36$$

7)

h[n]

1 •
0   2 •
        -1

x[n]

4 •
1 •   2   2 •
    1   3
       -5

$$y[0] = \sum_{k=-\infty}^{\infty} x[k]\, h[-k]$$

h[-k]

1 •
-2
  -1

y[0] = 1

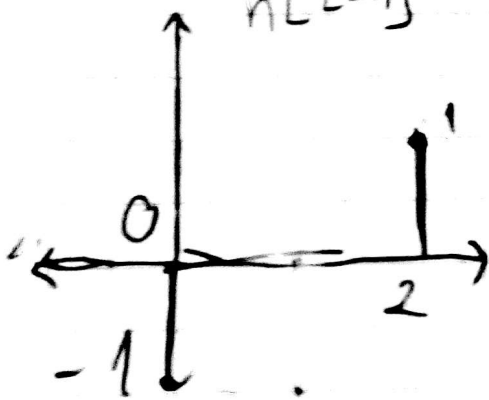$$y[1] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[1-k]$$

$h[1-n]$

$y[1] = -4$

$$y[2] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[2-k]$$
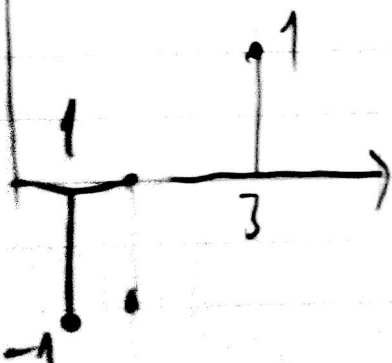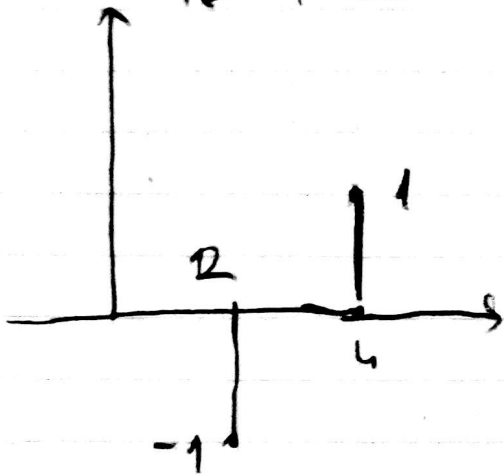
$h[2-n]$

$y[2] = -6$

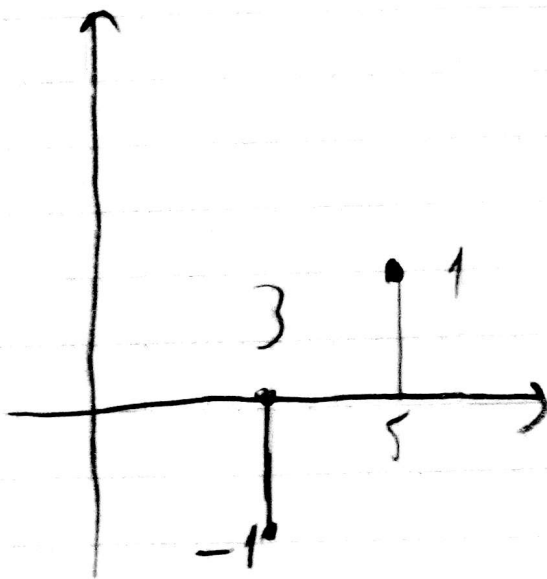$$y[3] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[3-k]$$

$y[3] = -2$

$$y[4] = \sum_{-\infty}^{\infty} x[l] \cdot h[4-l]$$

$h[4-k]$

$y[4] = 5$

$$y[5] = \sum_{-\infty}^{\infty} x[k] \cdot h[5-k]$$

$h[5-k]$

$y[5] = -2$