2.41 An algorithm for the calculation of the square root of a number α is given by [Mik92]

$$y[n] = x[n] - y^2[n-1] + y[n-1], \tag{2.139}$$

where $x[n] = \alpha\mu[n]$ with $0 < \alpha < 1$. If $x[n]$ and $y[n]$ are considered as the input and output of a discrete-time system, is the system linear or nonlinear? Is it time-invariant? As $n \to \infty$, show that $y[n] \to \sqrt{\alpha}$. Note that $y[-1]$ is a suitable initial approximation to $\sqrt{\alpha}$.

2.49 Consider the following sequences:

(i) $x_1[n] = 3\delta[n-2] - 2\delta[n+1]$, (ii) $x_2[n] = 5\delta[n-3] + 2\delta[n+1]$, (iii) $h_1[n] = -\delta[n+2] + 4\delta[n] - 2\delta[n-1]$,
(iv) $h_2[n] = 3\delta[n-4] + 1.5\delta[n-2] - \delta[n+1]$.

Determine the following sequences obtained by a linear convolution of a pair of the above sequences:

(a) $y_1[n] = x_1[n] \circledast h_1[n]$, (b) $y_2[n] = x_2[n] \circledast h_2[n]$, (c) $y_3[n] = x_1[n] \circledast h_2[n]$, (d) $y_4[n] = x_2[n] \circledast h_1[n]$.

2.52 Let $y[n] = x_1[n] \circledast x_2[n]$ and $v[n] = x_1[n-N_1] \circledast x_2[n-N_2]$. Express $v[n]$ in terms of $y[n]$.

2.66 Let $y[n]$ be the sequence obtained by a linear convolution of two causal finite-length sequences $h[n]$ and $x[n]$. For each pair of $y[n]$ and $h[n]$ listed below, determine $x[n]$. The first sample in each sequence is at time index $n = 0$.

(a) $\{y[n]\} = \{6,\ 11,\ -13,\ 16,\ 1,\ 9,\ 2,\ 8\}$, $\{h[n]\} = \{2,\ 5,\ -1,\ 4\}$,