Structural or analytic derivation

For a fixed constant input $x[n] = u$, the state matrix is

$$A(u) = \begin{pmatrix} 37/30 & -7u/30 \\ 1 & 0 \end{pmatrix}.$$

Its eigenvalues depend on u. This parameterized linear state analysis is distinct from a transfer function of the original input-dependent system. The delivered plot shows the well-defined pole-zero diagram for (i); the MATLAB script reports (ii)'s modelling obstruction.

Comparative cost and preferred method

Factoring the quadratic gives an exact unit-circle certificate with fixed arithmetic. A numerical root plot is illustrative, not the stability proof. Detecting the nonlinear product prevents a formally incorrect Z-transform reduction. There is no equivalent LTI baseline to accelerate for part (ii).

Source qualification

The product $y(n-2)x(n-1)$ was checked visually on physical source page 128.