

PROBLEM:

Given a feedback filter defined via the recursion:

$$y[n] = \frac{1}{2}y[n - 1] + x[n] \quad (\text{DIFFERENCE EQUATION})$$

When the input to the system is

$$x[n] = \begin{cases} +1 & \text{when } n = 0, 1, 2, 3 \\ 0 & \text{when } n < 0 \text{ and } n > 3 \end{cases}$$

determine the functional form for the output signal $y[n]$. Assume that the output signal $y[n]$ is zero for $n < 0$. This is called the *at rest* initial condition for the difference equation.