Voluntary exercise 2. A simple stochastic system

Consider a stochastic system

\[ y(k+1) = 0.9 y(k) + e(k+1) \] (1)

with \(\{e(k)\}\) being white noise with expectation \(E(e(k)) = 0\) and variance \(V(e(k)) = 1\).

Determine the expectation and variance of the output signal, that is \(E(y(k))\) and \(V(y(k))\).

Hint: \(\{y(k)\}\) is a stationary stochastic process. This means that \(E(y(k)) = E(y(k+1)) = E(y(k+2)) = \cdots\) as well as \(V(y(k)) = V(y(k+1)) = V(y(k+2)) = \cdots\).