4. A causal linear time-invariant (LTI) discrete-time system has a pair of poles and a pair of zeros. The poles are $\lambda_1 = \frac{1}{4} + j\frac{\sqrt{3}}{4}$ and $\lambda_2 = \frac{1}{4} - j\frac{\sqrt{3}}{4}$. The zeros are $\xi_1 = 0$ and $\xi_2 = \frac{1}{4}$. The system gain is $b_0/a_0 = 4$.

   (a) Is the system stable?

   (b) Write the difference equation for this system using only real-valued coefficients. You may assume that $a_0 = 1$.

   (c) The impulse response of this system may be written in the form:

   $$h[n] \quad = \quad c\,(r)^n \cos\left[\omega_0 n\right] u[n]$$

   Determine the values of the coefficients c, r and ω_0.

   (d) Suppose that the input to system is the sequence:

   $$x[n] \quad = \quad \left\{ \underset{\uparrow}{4}, -2, 1 \right\}$$

   Determine the corresponding output sequence.