1.1 Consider the discrete-time system specified by the input/output relationship

\[ y[n] = x[-(n^2)]. \]  

(1)

Determine whether or not this system possesses each of the following properties: linearity, time-invariance, causality, stability.

1.2 When the input to an LTI system is

\[ x[n] = 5u[n] \]  

(2)

the output is

\[ y[n] = \left[ 2\left(\frac{1}{2}\right)^n + 3\left(-\frac{3}{4}\right)^n \right] u[n]. \]  

(3)

(a) Determine the system function \( H(z) \) for this system. Sketch its pole-zero diagram and indicate the region of convergence of \( H(z) \).

(b) Determine the impulse response of the system, \( h[n] \).

(c) Write the difference equation that characterizes the system.