1. Determine the z-transforms of the following signals
   a. \( x(n) = (1 + n) u(n) \)
   b. \( x(n) = \frac{1}{2} (n^2 + n) \left( \frac{1}{3} \right)^{n-1} u(n - 1) \)

2. Determine the z-transforms and sketch the ROC of the following signal
   \[ x(n) = \begin{cases} \left( \frac{1}{3} \right)^n, & n \geq 0 \\ \left( \frac{1}{2} \right)^{-n}, & n < 0 \end{cases} \]

3. We want to design a casual discrete-time LTI system with the property that if the input is
   \[ x(n) = \left( \frac{1}{2} \right)^n u(n) - \frac{1}{4} \left( \frac{1}{2} \right)^{n-1} u(n - 1) \]
   and the output is
   \[ y(n) = \left( \frac{1}{3} \right)^n u(n) \]
   Determine the impulse response \( h(n) \) and the system function \( H(z) \) of a system that satisfies the foregoing conditions.

4. Show that the following systems are equivalent
   a. \( y(n) = 0.2 y(n - 1) + x(n) - 0.3 x(n - 1) + 0.02 x(n - 2) \)
   b. \( y(n) = x(n) - 0.1 x(n - 1) \)