ELEC 421 – Assignment # 3

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

$$x(n) = \left(\frac{1}{2}\right)^{n} \mathrm{u(n)} - \frac{1}{4}\left(\frac{1}{2}\right)^{n-1} \mathrm{u(n-1)}$$

   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. $y(n) = 0.2\,y(n-1) + x(n) - 0.3x(n-1) + 0.02x(n-2)$
   b. $y(n) = x(n) - 0.1x(n-1)$