Exercises Week 5

DSP

1. Find the Z transform of the following signals

   a.
   $$x[n] = \begin{cases} \left(\frac{1}{3}\right)^n, & n \geq 0 \\ \left(\frac{1}{2}\right)^{-n}, & n < 0 \end{cases}$$

   b.
   $$x[n] = \left(\frac{1}{2}\right)^n \sin(\frac{\pi}{3}n)u[n]$$

2. Compute the convolution of the two signals $x_1[n] = (-2)\left(\frac{1}{3}\right)^n u[n]$ and $x_2[n] = 7\left(\frac{-1}{5}\right)^n u[n]$ using the Z transform (Hint: Compute the Z transforms of the two signals, multiply, then do the inverse Z transform of the result via partial fractions decomposition)

3. Find all the signals $x[n]$ which have the Z transform
   $$X(z) = \frac{7}{(1-2z^{-1})(1+0.5z^{-1})}$$