Assignment - 2

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***Abstract*—This document contains the solution to Exercise 3.31 (a) of Oppenheim.**

Problem 1. Determine the z-transform and region of convergnce, and sketch the pole-zero diagram for the following sequence :

$$x[n] = a^n u[n] + b^n u[n] + c^n u[-n-1], \quad |a| < |b| < |c|$$

Solution:

$$x[n] = a^n u[n] + b^n u[n] + c^n u[-n-1] \quad |a| < |b| < |c|$$

$$X(z) = \frac{1}{1-az^{-1}} + \frac{1}{1-bz^{-1}} - \frac{1}{1-cz^{-1}} \quad |b| < |z| < |c|$$

$$X(z) = \frac{1 - 2cz^{-1} + (bc + ac - ab)z^{-2}}{(1-az^{-1})(1-bz^{-1})(1-cz^{-1})} \quad |b| < |z| < |c|$$

Poles : a,b,c

Zeros : z_1, z_2, ∞ where z_1 and z_2 are roots of numerator quadratic