- The z-Transform
- The Region of Convergence for z-Transforms
- The Inverse z-Transform
- Geometric Evaluation of the Fourier Transform
- Properties of the z-Transform
- Some Common z-Transform Pairs
- Analysis & Characterization of LTI Systems Using the z-Transforms
- System Function Algebra and Block Diagram Representations
- The Unilateral z-Transform

Problem 10.2: zT, ROC

10.2. Consider the signal

$$x[n] = \left(\frac{1}{5}\right)^n u[n-3].$$

Use eq. (10.3) to evaluate the z-transform of this signal, and specify the corresponding region of convergence.

Problem 10.4: zT, ROC, Poles

10.4. Consider the signal

$$x[n] = \begin{cases} (\frac{1}{3})^n \cos(\frac{\pi}{4} n), & n \leq 0 \\ 0, & n > 0 \end{cases}.$$

Determine the poles and ROC for $X(z)$.

Problem 10.7: ROC

10.7. Suppose that the algebraic expression for the z-transform of $x[n]$ is

$$X(z) = \frac{1 - \frac{1}{4}z^{-2}}{(1 + \frac{1}{4}z^{-2})(1 + \frac{5}{4}z^{-1} + \frac{3}{8}z^{-2})}.$$

How many different regions of convergence could correspond to $X(z)$?

Problem 10.9: IzT

10.9. Using partial-fraction expansion and the fact that

$$a^n u[n] \overset{z}{\longleftrightarrow} \frac{1}{1 - az^{-1}}, \quad |z| > |a|,$$

find the inverse z-transform of

$$X(z) = \frac{1 - \frac{1}{3}z^{-1}}{(1 - z^{-1})(1 + 2z^{-1})}, \quad |z| > 2.$$

Problem 10.24: IzT

10.24. Using the method indicated, determine the sequence that goes with each of the following z-transforms:

(a) Partial fractions:

$$X(z) = \frac{1 - 2z^{-1}}{1 + \frac{5}{2}z^{-1} + z^{-2}}, \text{ and } x[n] \text{ is absolutely summable.}$$

(b) Long division:

$$X(z) = \frac{1 - \frac{1}{2}z^{-1}}{1 + \frac{1}{2}z^{-1}}, \text{ and } x[n] \text{ is right sided.}$$

(c) Partial fractions:

$$X(z) = \frac{3}{z - \frac{1}{4} - \frac{1}{8}z^{-1}}, \text{ and } x[n] \text{ is absolutely summable.}$$