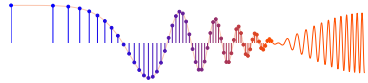

Example 7-4: z-transform of a Signal

Recall that any finite-length sequence $x[n]$ can be represented as a sum of scaled and shifted impulse sequences as in

$$x[n] = \sum_{k=0}^{N} x[k]\delta[n-k] \tag{7.10}$$

Furthermore, recall from (7.4) that for a single shifted unit impulse sequence,

$$\delta[n-k] \quad \overset{z}{\longleftrightarrow} \quad z^{-k} \tag{7.11}$$

Thus, applying (7.11) to each impulse in (7.10) and then adding the individual z-transforms according to (7.9), we obtain as before

$$X(z) = \sum_{k=0}^{N} x[k]z^{-k}$$

