# 8.1

Consider the sequence given by . Assume . A periodic sequence is constructed from in the following way:

1. Determine the Fourier transform of .
2. Determine the discrete Fourier series of of .
3. How is related to .

# 8.2

Compute the DFT of each of the following finite-length sequences considered to be of length (where *N* is even).

# 8.3

Consider the finite-length sequences in Figure 8-1. Let be the z-transform of . If we sample at , =0,1,2,3, we obtain

, =0,1,2,3.

Sketch the sequence obtained as the inverse DFT of .

1

-2 -1 0 1 2 3 4 5 6 7

**Figure 8-1**

# 8.4

Suppose we have two four-point sequences and as follows:

1. Calculate the four-point DFT .
2. Calculate the four-point DFT .
3. Calculate by doing the circular convolution directly.
4. Calculate of Part (c) by multiplying the DFTs of and and performing an inverse DFT.

# 8.5

Figure 8-2(a) and (b) shows two sequences and . The value of at time is not known, but is shown as a variable . Figure 8-2(c) shows , the four-point circular convolution of and . Based on the graph of , can you specify uniquely? If so, what is ? If not, give two possible values that would yield the sequence as shown.

1

-2 -1 0 1 2 3 4 5 6 7

2

1

(a)

1

-2 -1 0 1 2 3 4 5 6 7

(b)

(c)

-1

1

-2 -1 0 1 2 3 4 5 6 7

1

-1

**Figure 8-2**

# 8.6

Figure 8-3 shows two finite-length sequences. Sketch their -point circular convolution for =6 and for =10.

6

-2 -1 0 1 2 3 4 5 6 7

2

1

1

-2 -1 0 1 2 3 4 5 6 7

1

3

4

5

**Figure 8-3**

# 8.7

Two finite-length sequences and , which are zero outside the interval , are circularly convolved to form a new sequence ; i.e.,

If, in fact, is nonzero only for , determine the set of values of *n* for which is guaranteed to be identical to the linear convolution of and .

# 8.8

Let be a real-valued 5-point sequence whose 7-point DFT is denoted by . If is the 7-point DFT of , show that , and determine the relationship between . Justify your answer.

# 8.9

Suppose is an infinite-length, stable (i.e., absolutely summable) sequence with z-transform given by

Suppose is a finite-length sequence of length *N*, and the *N*-point DFT of is

Determine .