

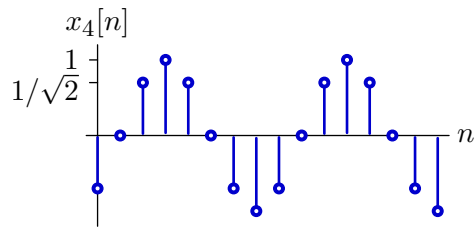
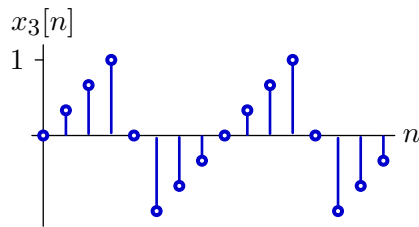
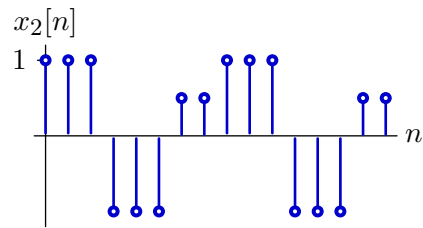
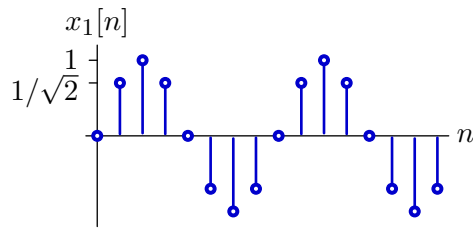
6.003 Homework 10

Due at the beginning of recitation on **Wednesday, April 21, 2010.**

Problems

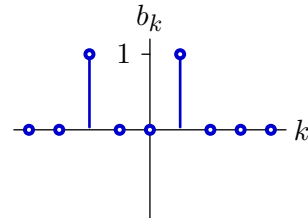
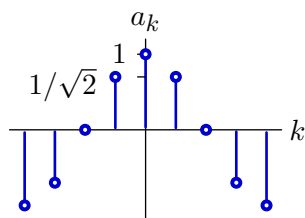
1. DT Fourier Series

Determine the Fourier Series coefficients for each of the following DT signals, which are periodic in $N = 8$.



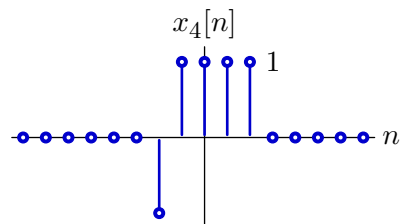
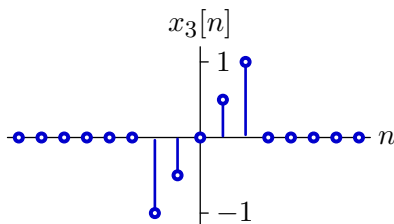
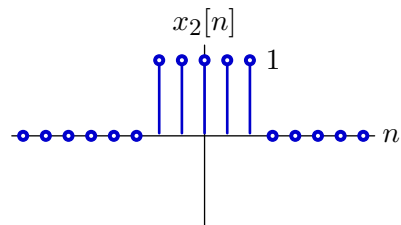
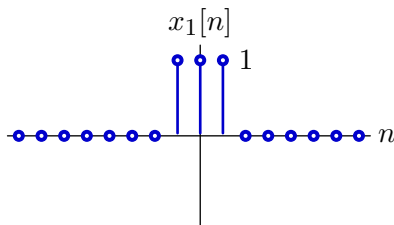
2. Inverse DT Fourier Series

Determine the DT signals with the following Fourier series coefficients. Assume that the signals are periodic in $N = 8$.



3. DT Fourier transforms

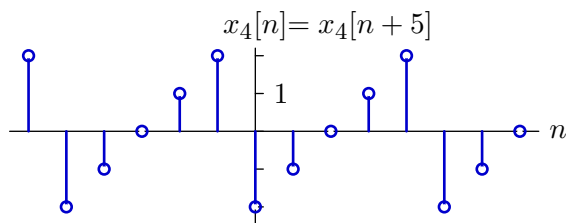
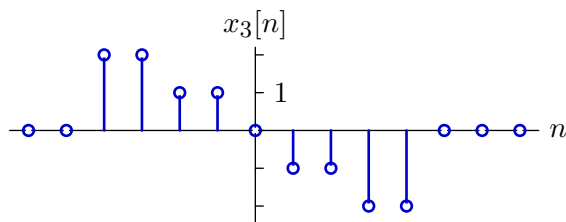
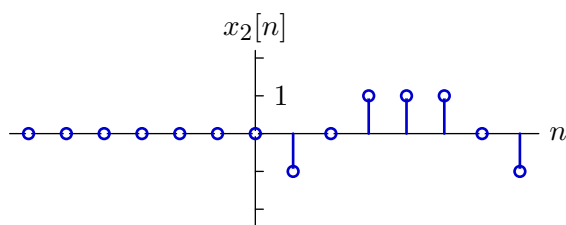
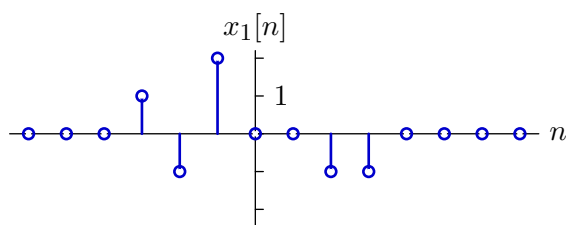
Find the Fourier transforms of the following signals, which are 0 for $|n| > 7$.



4. Which are True?

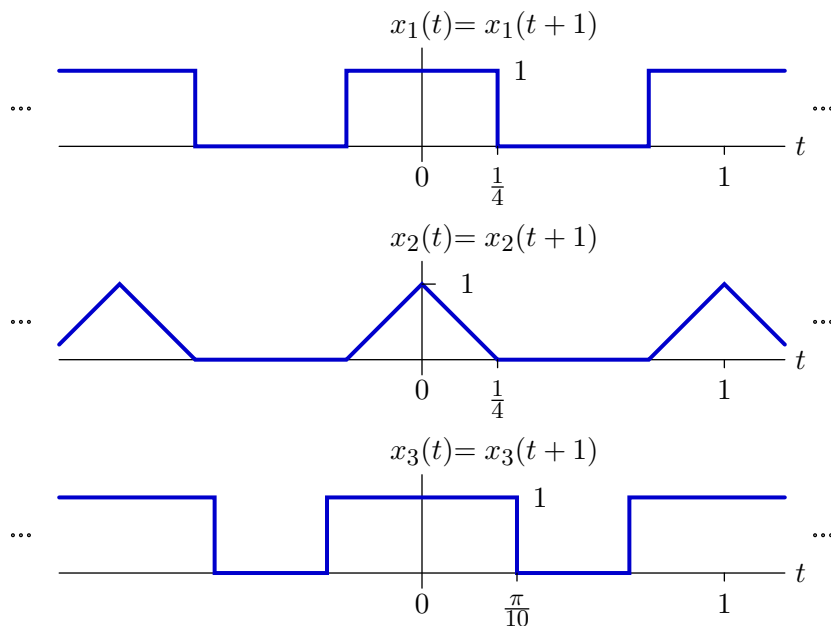
For each of the DT signals $x_1[n]$ through $x_4[n]$ (below), determine whether the conditions listed in the following table are satisfied, and answer **T** for true or **F** for false.

	$x_1[n]$	$x_2[n]$	$x_3[n]$	$x_4[n]$
$X(e^{j0}) = 0$				
$\int_{-\pi}^{\pi} X(e^{j\Omega}) d\Omega = 0$				
$X(e^{j\Omega})$ is purely imaginary				
$e^{jk\Omega} X(e^{j\Omega})$ is purely real for some integer k				

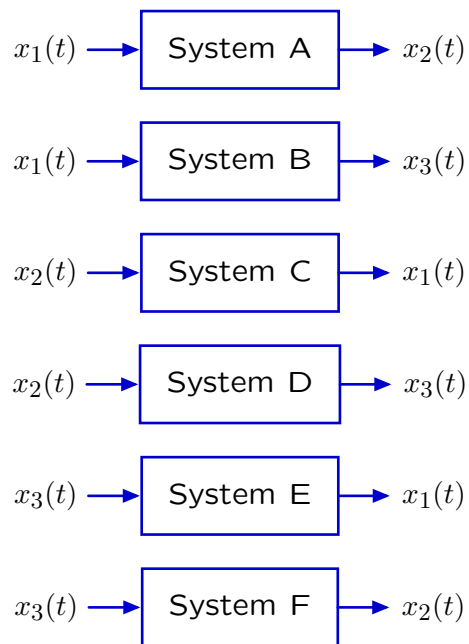


5. Input/Output Pairs

The following signals are all periodic with period $T = 1$.



Indicate which of the systems could or could not be linear and time-invariant.



Engineering Design Problem

6. Image reconstruction

The rows and/or columns of the following images have been blurred. Figure out a way to sharpen each image, and identify the building. Here are thumbnails of the images:



a1



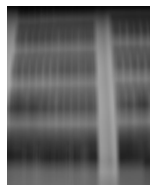
a2



b1



b2



c1



c2

The images are available in machine-readable form ([buildings.zip](#)) on our website.