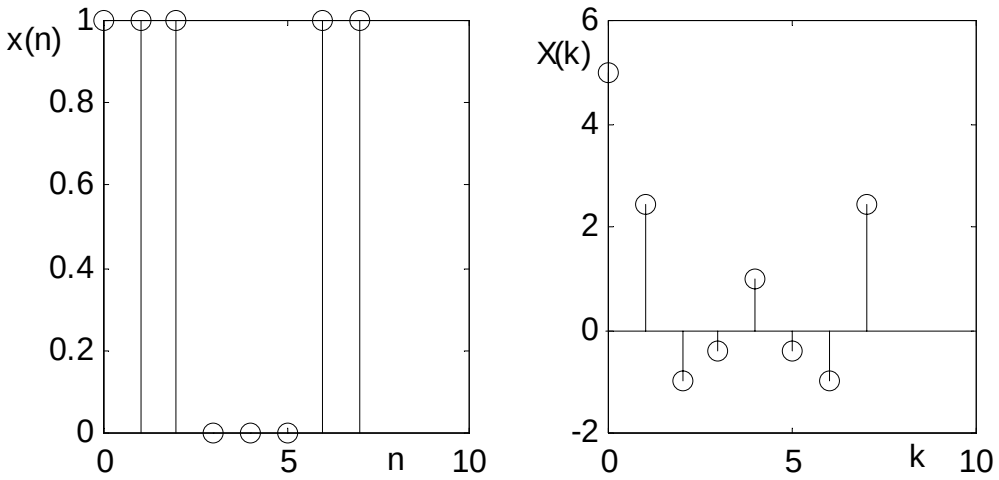
EE 464 **Pop Quiz** October 22, 2004 T. R. Fischer

Open book, open notes.

1. Let $h_0(n) = 0.25\ [1, 2, 1]$, $h_1(n) = 0.125\ [-1, -2, 6, -2, -1]$, $g_0(n) = [0.125\ [-1, 2, 6, 2, -1]$, and $g_1(n) = 0.25\ [-1, 2, -1]$.

a. Let x = [0, 1, 2, 3, 4, 3, 2, 1, 0, 0, 0, …]. Find $y_1(n) = x(n) * h_0(n)$. What is the delay of this filter?
b. Let $h(n) = h_0(n)*g_0(n) + h_1(n)*g_1(n)$. Find h(n). What is the delay of this filter?

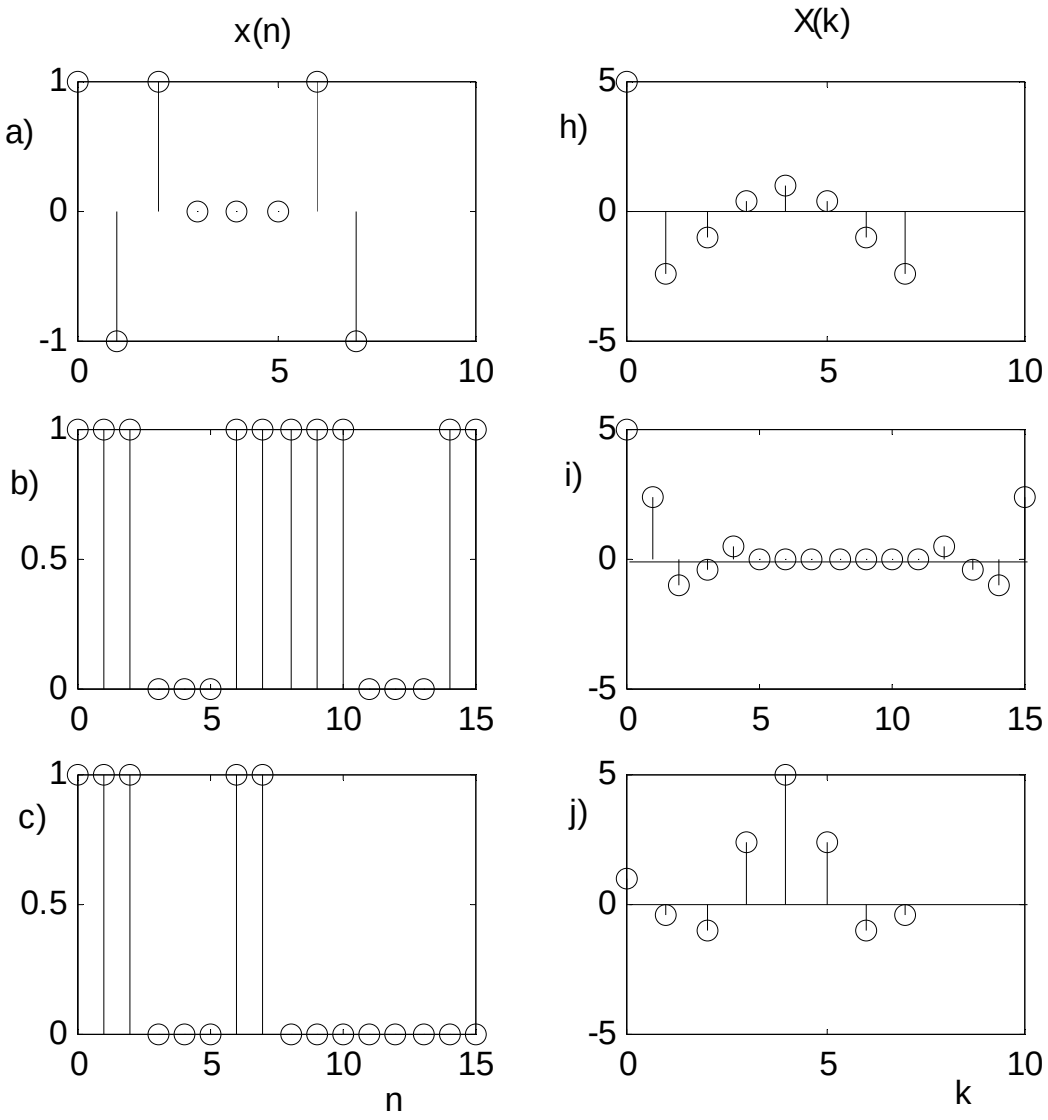
2. Below are plots of x(n) = [1, 1, 1, 0, 0, 0, 1, 1] and its 8-point DFT, X(k).

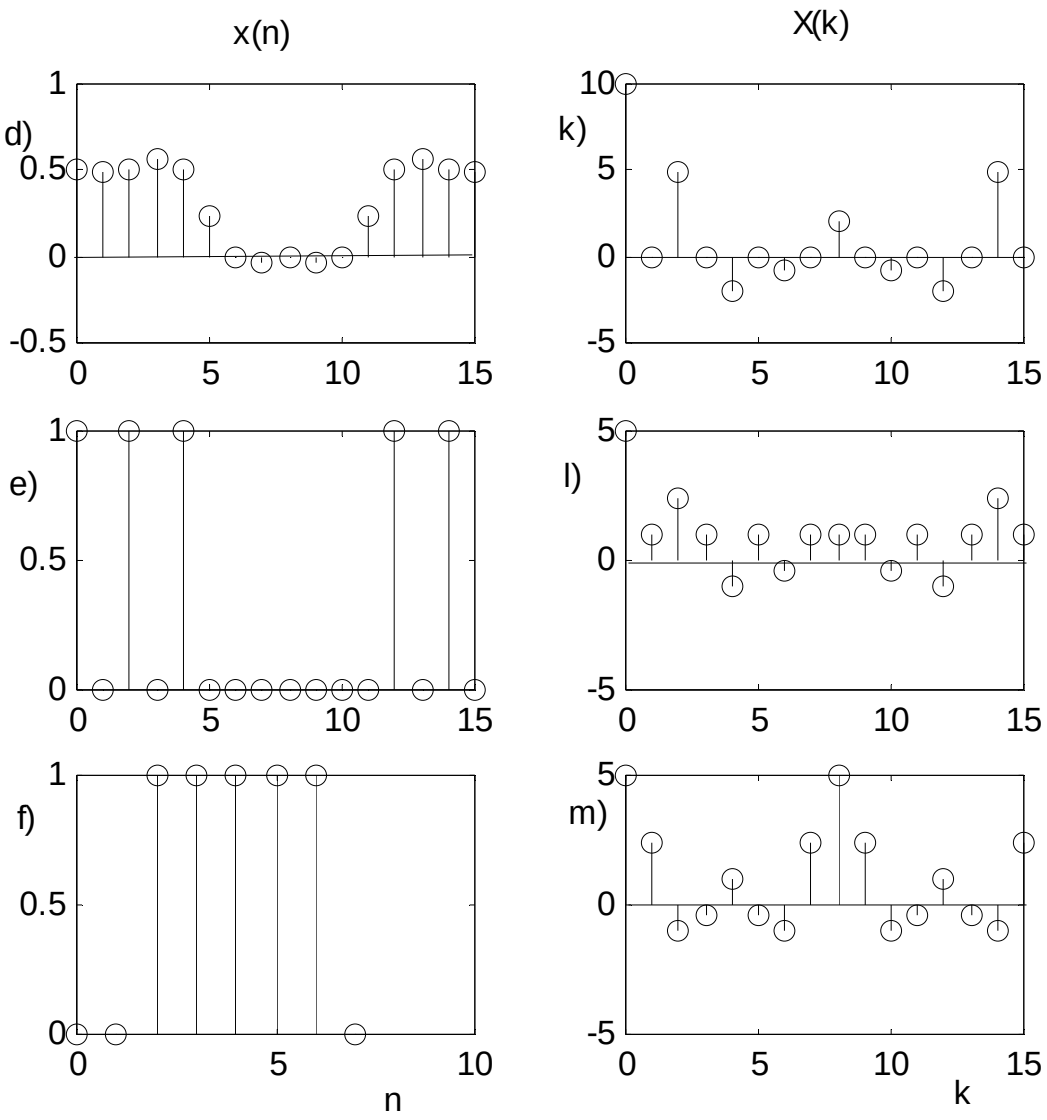


The signals six signals below are derived from x(n) or X(k). Find, for each case, the correct plot of the respective DFT or IDFT.

i) $x_1(n) = [x(0), …, x(7), x(0), …, x(7)]$. Find the plot of the 16-point DFT of $x_1(n)$.
ii) $x_2(n) = [x(0), 0, x(1), 0, …, x(7), 0]$. Find the plot of the 16-point DFT of $x_2(n)$.
iii) $x_3(n) = (-1)^n x(n)$. Find the plot of the 8-point DFT of $x_3(n)$.
iv) $x_4(n) = x(n-4)$, (where delay means circular shift). Find the plot of the 8-point DFT of $x_4(n)$.
v) $x_5(n) = [x(0), …, x(7), 0, …, 0]$. Find the plot of the 16-point DFT of $x_5(n)$.
vi) $X_6(k)=[X(0), …, X(3), 0.5\ X(4), 0, 0, 0, 0, 0, 0, 0, 0.5\ X(4), X(5), …, X(7)]$. Find the plot of the 16-point IDFT of $X_6(k)$.

Below are twelve figures: the six on the left (a-f) are plots of time signals, the six on the right (h-m) are plots of frequency signals. Correctly match the figures below to the signals to be identified in i) – vi) above.


x(n)
X(k)
a)
h)
b)
i)
c)
j)
1
0
-1
5
0.5
-5
0
5
10
15
n
k


x(n)
X(k)
d)
k)
e)
l)
f)
m)
n
k