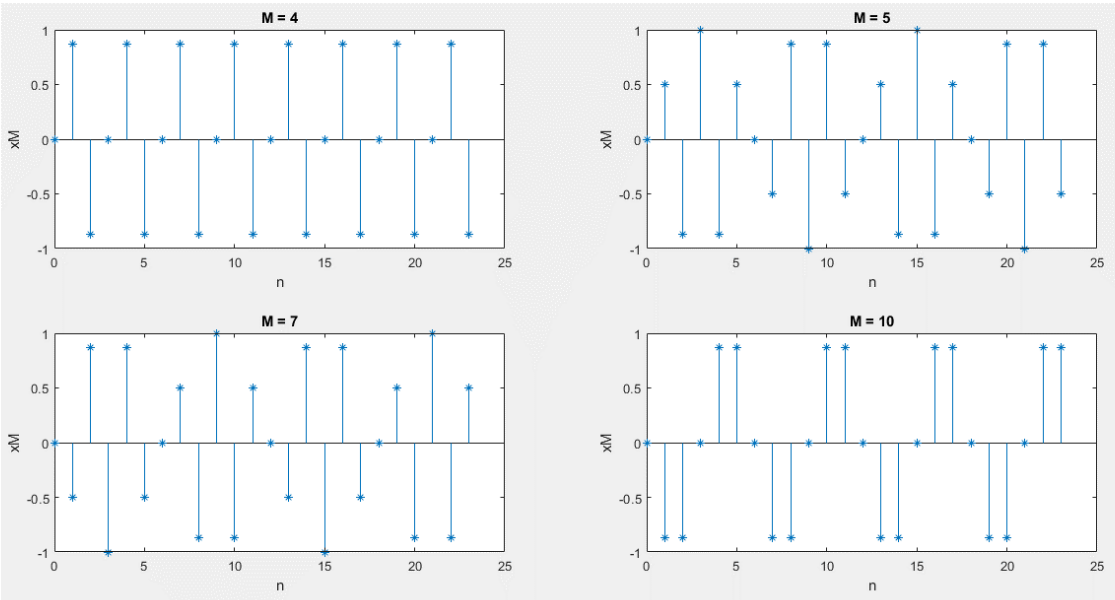
Sefa Kayraklık
2015104066

EE473 HW0

Question 1:

a)



The fundamental period is the lowest integer N that holds the following expression: $x[n] = x[n+N]$

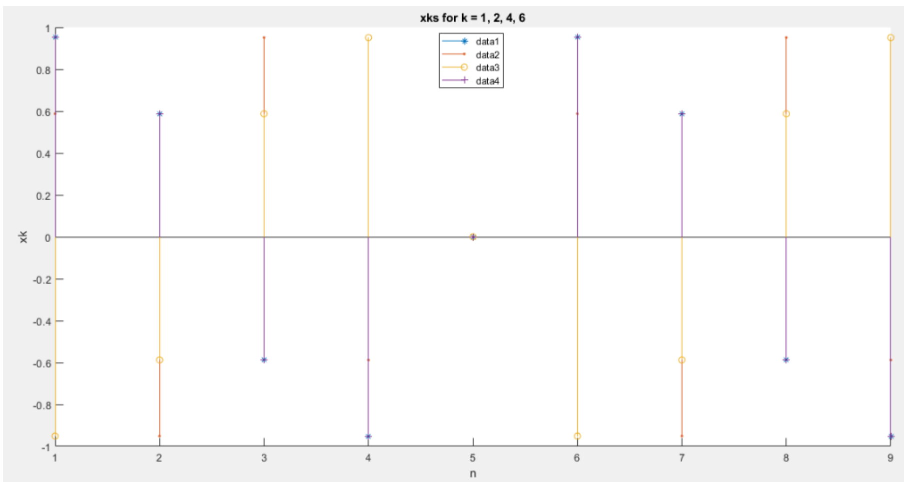
For M = 4, $x_4[n] = \sin\left(\frac{2\pi}{3}n\right)$; N = 3, $x_4[n+N] = \sin\left(\frac{2\pi}{3}n + 2\pi\right) = x_4[n]$

For M = 5, $x_5[n] = \sin\left(\frac{5\pi}{6}n\right)$; N = 12, $x_5[n+N] = \sin\left(\frac{5\pi}{6}n + 10\pi\right) = x_5[n]$

For M = 7, $x_7[n] = \sin\left(\frac{7\pi}{6}n\right)$; N = 12, $x_7[n+N] = \sin\left(\frac{7\pi}{6}n + 14\pi\right) = x_7[n]$

For M = 10, $x_{10}[n] = \sin\left(\frac{5\pi}{3}n\right)$; N = 6, $x_{10}[n+N] = \sin\left(\frac{5\pi}{6}n + 10\pi\right) = x_{10}[n]$

b)



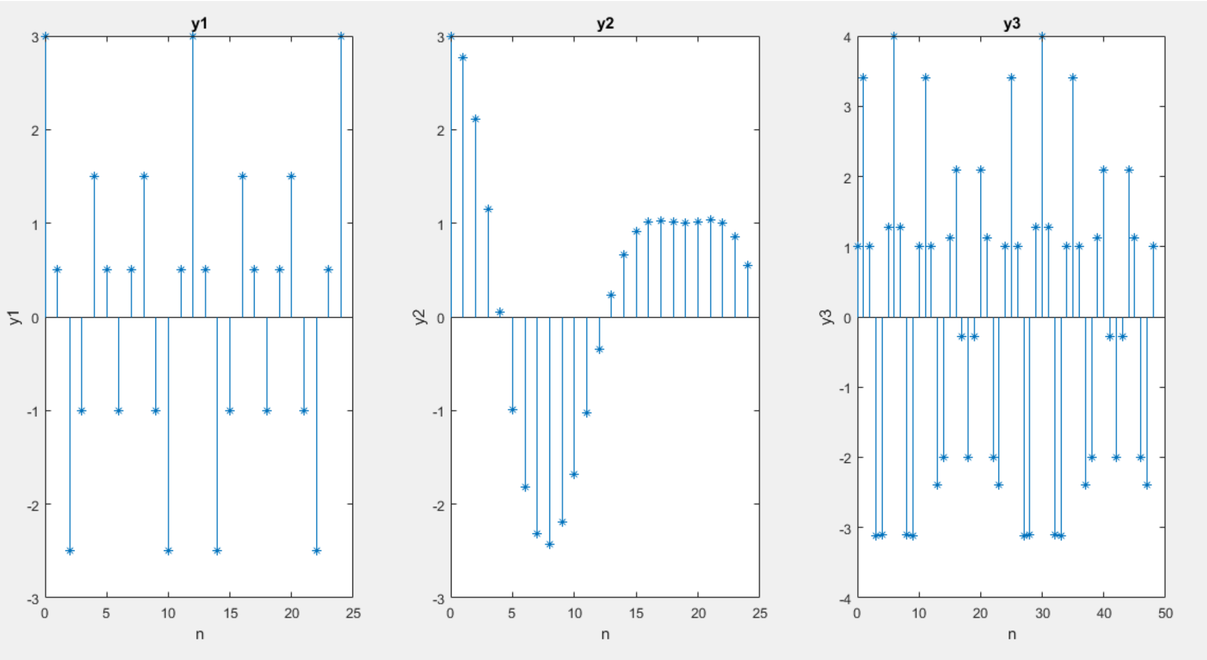
There are 3 unique signals. The signals with k=1 and k=6 give the same result. Since the signal is periodic and the fundamental period of the signal is 5; so, the signal with k=1 and k=6 hold the periodicity equation $x[n] = x[n+N]$. Therefore, both the signals have the same plot.

c)

$y_1[n] = \cos\left(\frac{2\pi}{6}n\right) + 2\cos\left(\frac{3\pi}{6}n\right)$; <u>N = 12</u>, $y_1[n+N] = \cos\left(\frac{2\pi}{6}n + 6\pi\right) + 2\cos\left(\frac{3\pi}{6}n + 6\pi\right) = y_1[n]$

$y_2[n]$ is not periodic since there is no such N integer that fields the periodicity equation $x[n] = x[n+N]$. Therefore $y_2[n]$ is not periodic.

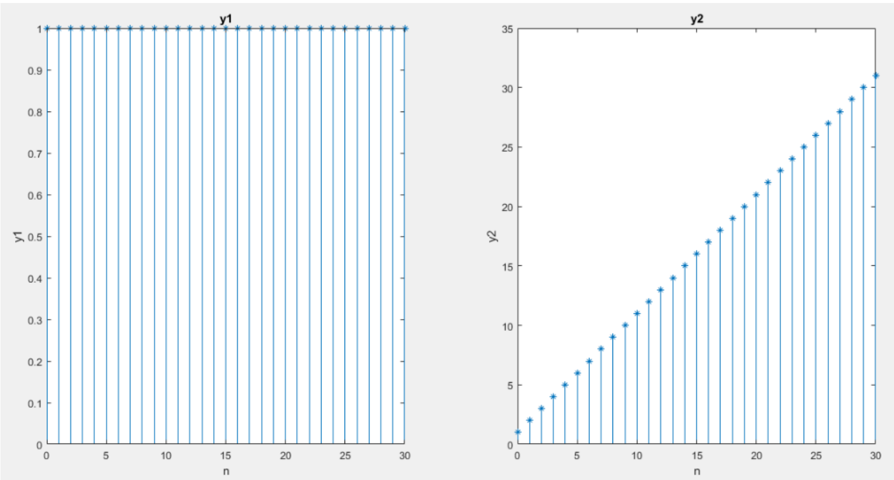
$y_3[n] = \cos\left(\frac{2\pi}{6}n\right) + 3\sin\left(\frac{5\pi}{12}n\right)$; <u>N = 24</u>, $y_3[n+N] = \cos\left(\frac{2\pi}{6}n + 8\pi\right) + 3\sin\left(\frac{5\pi}{12}n + 10\pi\right) = y_3[n]$



Question 2:

a) The function's written and uploaded to the Moodle.

b)



Since the Dirac delta function has 1 in the 1st index and elsewhere 0, the output takes all the elements 1. So, the output is constant y = 1 function.

Since the unit-step function has all 1 in its indies, and a is equal to 1; the output takes the sum of 1 and its previous value.