Problem 8.12

Given, $x[n] = 3 + 2e^{j0.2\pi n} + 2e^{-j0.2\pi n} - 7je^{j0.7\pi n} + 7je^{-j0.7\pi n}$

(a) Plot of DFS for $x[n]$ using only positive frequencies from $0 \leq \hat{\omega} \leq 2\pi$:

In order to convert to frequencies from $0 \leq \hat{\omega} \leq 2\pi$, finding the alias frequencies of the negative frequencies:

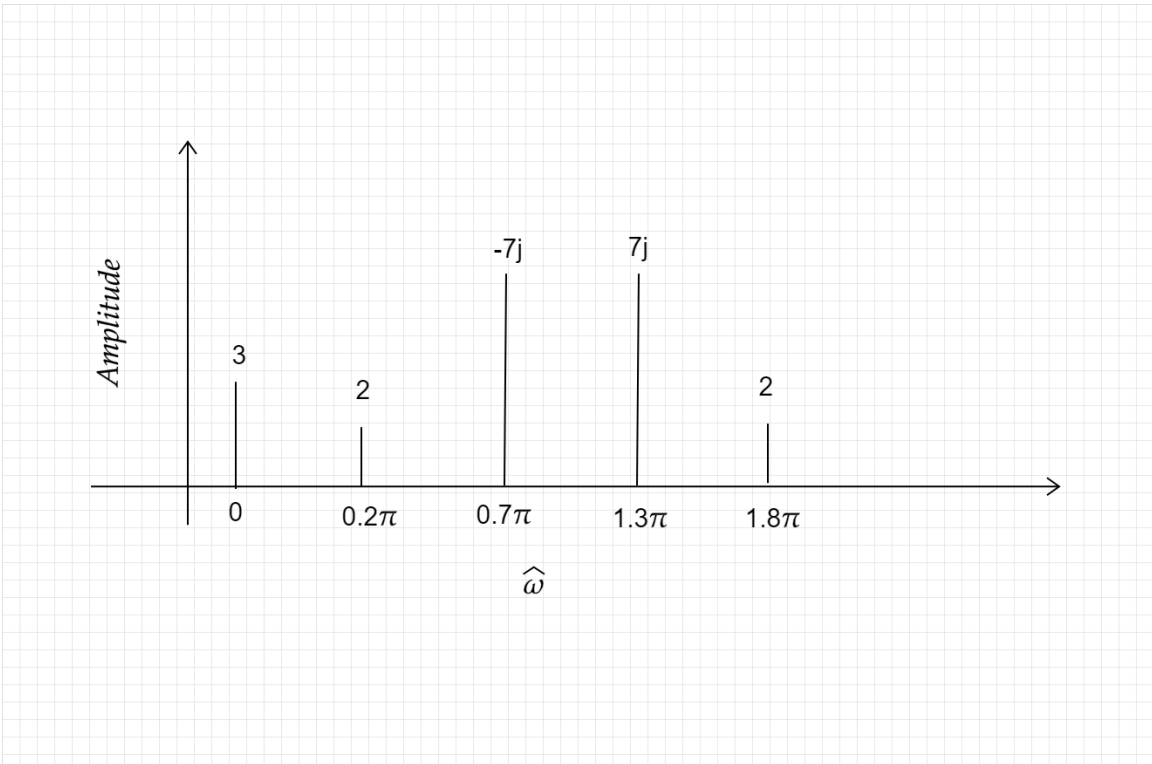
$i) - 0.2\pi - > -0.2\pi + 2\pi = 1.8\pi$

$ii) - 0.7\pi - > -0.7\pi + 2\pi = 1.4\pi$

Then, $x[n]$ can be written as:

$x[n] = 3 + 2e^{j0.2\pi n} + 2e^{j1.8\pi n} - 7je^{j0.7\pi n} + 7je^{j1.3\pi n}$.

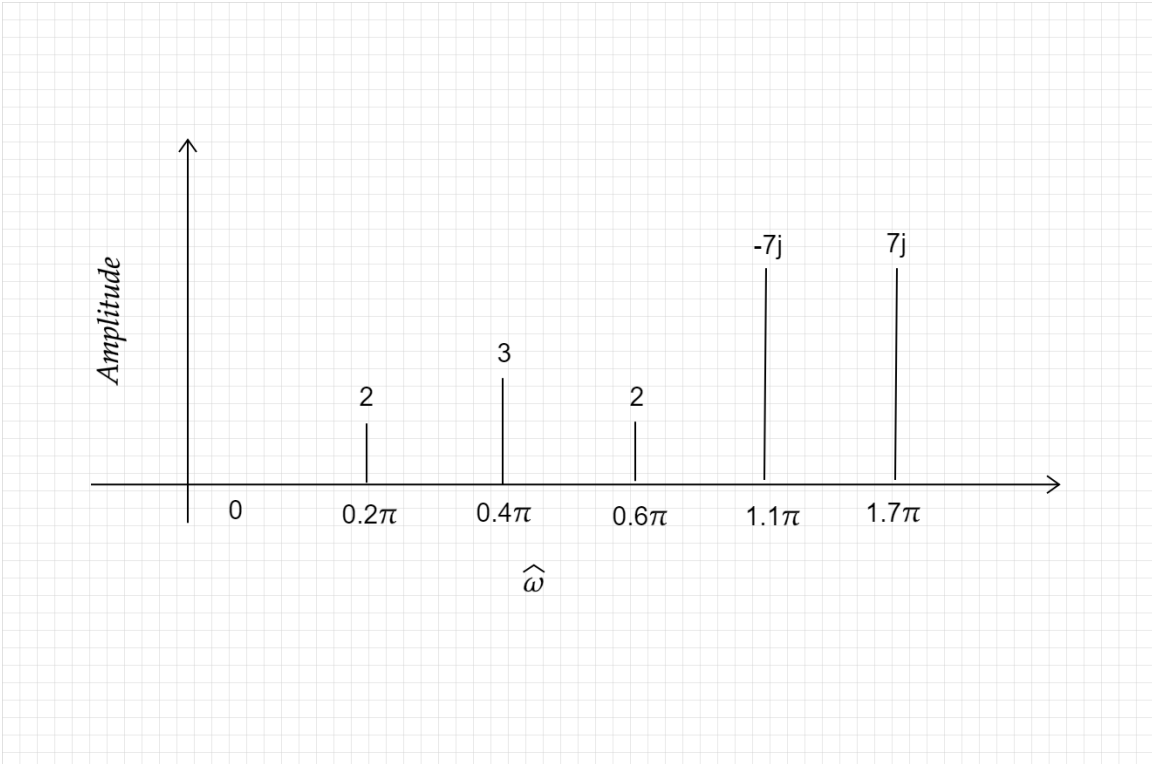
Plot:



(b)Given, $x_1[n] = x[n]e^{j0.4\pi n}$

Then, $x_1[n] = 3e^{j0.4\pi n} + 2e^{j0.6\pi n} + 2e^{j0.2\pi n} - 7je^{j1.1\pi n} + 7je^{j1.7\pi n}$

Plot:



(c)Given, $x_2[n] = (-1)^n x[n]$

$e^{j\pi} = -1$ and $(-1)^n x[n] = e^{j\pi n} x[n]$

Then, $x_2[n] = 3e^{j\pi n} + 2e^{j1.2\pi n} + 2e^{-j0.8\pi n} - 7je^{j1.7\pi n} + 7je^{j0.3\pi n}$

Plot: