Philip Nevins

10/21/2022

ECE 315 Signals and Systems

HW#2 Problem 4  
  
The two signals are identical. There is a very small shift due to the difference in the 3 -> 207 in the numerator of the pi\*n side of the phase. This makes sense, because 207/3 = 69, so there only real difference is the phase angel.  
  
**Signal X1[n]**

Chart

Description automatically generated

Chart

Description automatically generated

# -\*- coding: utf-8 -\*-

"""

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HW#2, Problem 4, x1[n]

"""

import numpy as np

import matplotlib.pyplot as plt

lastn = 38

n = np.arange(0, lastn + 1) # time vector

oneVec = np.ones(np.size(n)) # vector of ones for phase shift

phase = ((3\*np.pi\*n) / 51) - (np.pi/12)\*oneVec

mag = 6.0

xre = mag\*np.cos(phase) # real part of x1[n]

xim = mag\*np.sin(phase) # imag part of x1[n]

fig, ax = plt.subplots(1, figsize=(15,6))

ax.stem(n, xre)

ax.set\_xlim([0, lastn])

ax.set\_ylim([-6, 6])

ax.set\_title("Real Part of Signal x1[n]")

ax.set\_xlabel("Time n")

ax.set\_ylabel("Re{x1[n]}")

fig, ax = plt.subplots(1, figsize=(15,6))

ax.stem(n, xim)

ax.set\_xlim([0, lastn])

ax.set\_ylim([-6, 6])

ax.set\_title("Imaginary Part of Signal x1[n]")

ax.set\_xlabel("Time n")

ax.set\_ylabel("Im{x1[n]}")

**Signal X2[n]**

Chart

Description automatically generated

Chart

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HW#2, Problem 4, x2[n]

"""

import numpy as np

import matplotlib.pyplot as plt

lastn = 38

n = np.arange(0, lastn + 1) # time vector

oneVec = np.ones(np.size(n)) # vector of ones for phase shift

phase = ((207\*np.pi\*n) / 51) - (np.pi/12)\*oneVec

mag = 6.0

xre = mag\*np.cos(phase) # real part of x2[n]

xim = mag\*np.sin(phase) # imag part of x2[n]

fig, ax = plt.subplots(1, figsize=(15,6))

ax.stem(n, xre)

ax.set\_xlim([0, lastn])

ax.set\_ylim([-6.25, 6.25])

ax.set\_title("Real Part of Signal x2[n]")

ax.set\_xlabel("Time n")

ax.set\_ylabel("Re{x2[n]}")

fig, ax = plt.subplots(1, figsize=(15,6))

ax.stem(n, xim)

ax.set\_xlim([0, lastn])

ax.set\_ylim([-6.25, 6.25])

ax.set\_title("Imaginary Part of Signal x2[n]")

ax.set\_xlabel("Time n")

ax.set\_ylabel("Im{x2[n]}")