

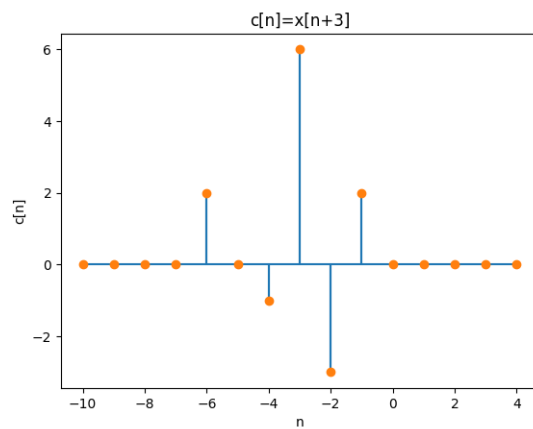
# ECE 113 HW 1

Lawrence Liu

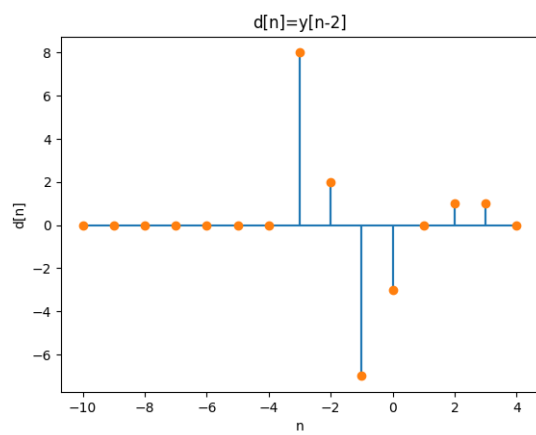
October 4, 2022

## Problem 1

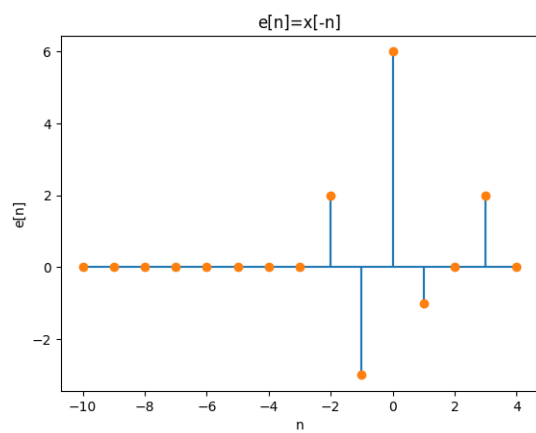
(a)



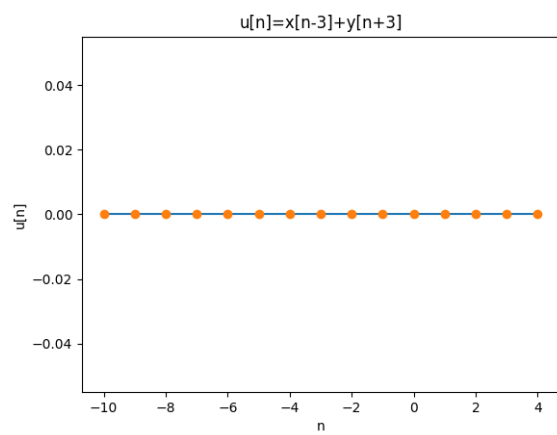
(b)



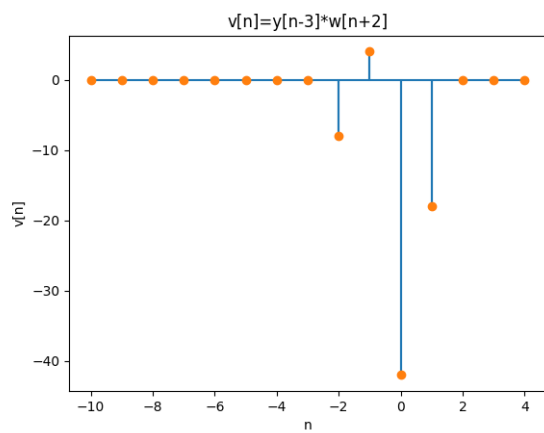
(c)



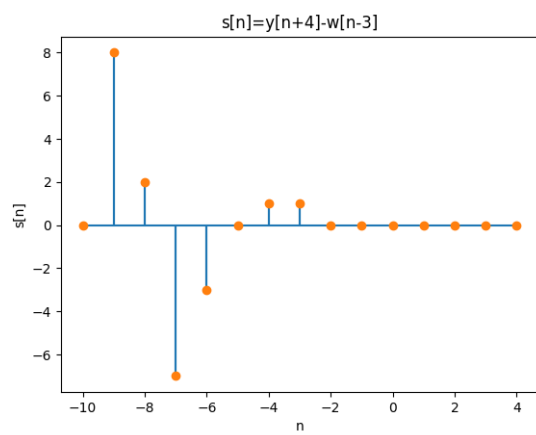
(d)



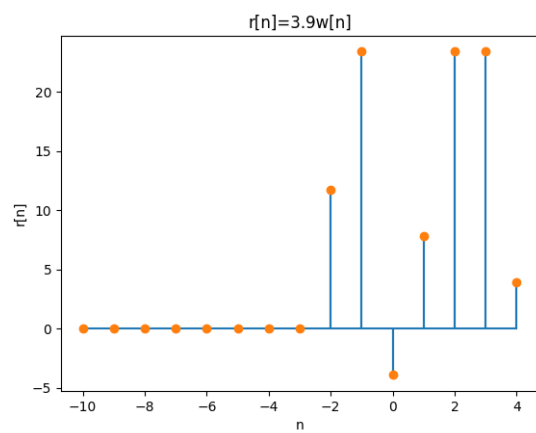
(e)



(f)



(g)



## Problem 2

(a)

20

(b)

25

(c)

40

(d)

80

(e)

20

(f)

8

### Problem 3

(a)

Since  $e^{j\theta} = \cos(\theta) + j \sin(\theta)$ , we have that the fundamental period of  $\hat{x}_a[n]$  is 8

(b)

We have that  $F_0 = 0.3$ , therefore we have that the period of the sequence is  $\frac{k}{0.3}$ . The minimum  $k$  such that this evaluates to a positive integer is  $k = 3$ . Therefore, the fundamental period of the sequence is 10.

(c)

The period of  $e^{j\pi n/8}$  is 16 and the period of  $e^{j\pi n/5}$  is 10. Therefore, the period of the sequence is the least common multiple of these two, which is 80.

(d)

The period of  $\sin(0.15\pi n)$  is 40 and the period of  $\cos(0.12\pi n + 0.1\pi)$  is 50. Therefore, the period of the sequence is the least common multiple of these two, which is 200.

(e)

The period of  $\sin(0.15\pi n + 0.75\pi)$  is 10 and the period of  $\cos(0.8\pi n + 0.2\pi)$  is 5, and the period of  $\cos(1.3\pi n)$  is 20. Therefore, the period of the sequence

is the least common multiple of these three, which is  $\boxed{20}$ .

## **Problem 4**