

CENG 384 - Signals and Systems for Computer Engineers
Spring 2023
Homework 1

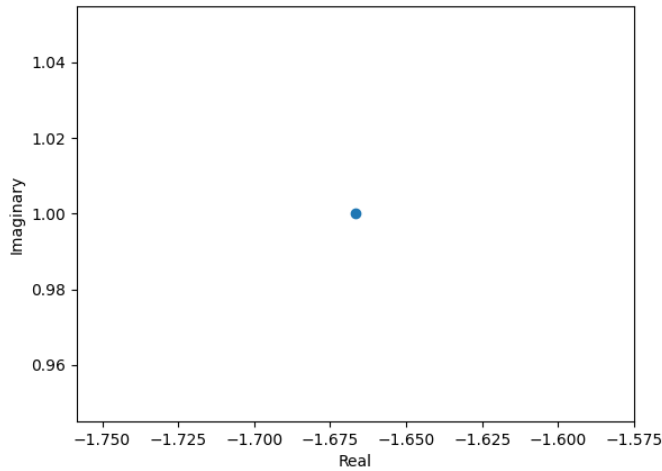
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1. (a)

$$\begin{aligned}z &= x + yj \implies \bar{z} = x - yj \\2z + 5 &= j - \bar{z} \\2(x + yj) + 5 &= j - (x - yj) \\2x + 5 + 2yj &= (1 + y)j - x \\y &= 1, x = -5/3 \\z &= -5/3 + j \\|z|^2 &= 25/9 + 1 = 26/9\end{aligned}$$



(b)

$$\begin{aligned}z &= re^{j\theta} \implies z^5 = r^5 e^{j5\theta} \\32j &= 32e^{j\pi/2} \\32e^{j\pi/2} &= r^5 e^{j5\theta} \implies r = 2, \theta = \pi/10 \\z &= 2e^{j\pi/10}\end{aligned}$$

(c)

(d)

$$\begin{aligned}z &= je^{-j\pi/2} \\&= e^{j\pi/2} e^{-j\pi/2} \\&= e^0 = 1\end{aligned}$$

2. drawing

3. (a) drawing

(b)

$$x[n] = -\delta[n-1] + 2\delta[n-2] + -4\delta[n-4] + 3\delta[n-7]$$

$$x[-n] = -\delta[-n-1] + 2\delta[-n-2] + -4\delta[-n-4] + 3\delta[-n-7]$$

$$x[2n-1] = -\delta[2n-2] + 2\delta[2n-3] + -4\delta[2n-5] + 3\delta[2n-8]$$

$$x[-n] + x[2n-1] = -\delta[-n-1] + 2\delta[-n-2] - 4\delta[-n-4] + 3\delta[-n-7] - \delta[2n-2] + 2\delta[2n-3] - 4\delta[2n-5] + 3\delta[2n-8]$$

4. (a) $2\pi/3$

(b) 20, proof?

(c) 2π , proof?

5. (a) $x(t) = u[t-1] - 3u[t-3] + u[t-4]$

(b) $\frac{dx(t)}{dt} = \delta(t-1) - 3\delta(t-3) + \delta(t-4)$ draw?

6. (a)

(b)

7. (a)

(b)