CENG 384 - Signals and Systems for Computer Engineers
Spring 2023
Homework 1
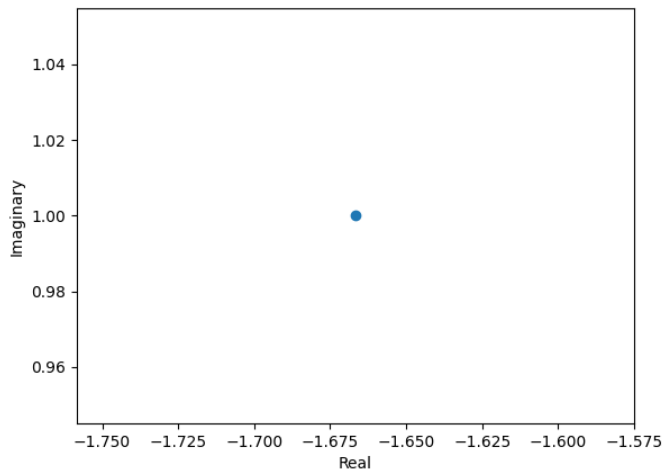
Geçit, Emre
e2521581@ceng.metu.edu.tr

LastName2, FirstName2
exxxxxxx@ceng.metu.edu.tr

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1. (a)

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

(b)

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

(c)
(d)

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

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)