GATE ASSIGNMENT 4

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Download python codes from

https://github.com/Dishank422/EE3900/blob/main/quiz1/codes

and latex-tikz codes from

https://github.com/Dishank422/EE3900/blob/main/quiz1/latex_code.tex

1 Discrete Time Signal Processing 2.28(c)

Determine if $x[n] = ne^{j\pi n}$ is periodic. If it is periodic, determine it's period.

2 Solution

Definition 1. *A signal x[n] is said to be periodic if for all n, for some $n_0 > 0$, it satisfies*

$$x[n + n_0] = x[n] \tag{2.0.1}$$

Suppose $ne^{j\pi n}$ is periodic, then for some $n_0 > 0$,

$$ne^{j\pi n} = (n + n_0)e^{j\pi(n+n_0)} \tag{2.0.2}$$

$$\implies |ne^{j\pi n}| = |(n + n_0)e^{j\pi(n+n_0)}| \tag{2.0.3}$$

$$\implies |n| = |n + n_0| \tag{2.0.4}$$

Let n be positive.

$$\implies n = n + n_0 \tag{2.0.5}$$

$$\implies n_0 = 0 \tag{2.0.6}$$

This contradicts the assumption: $n_0 > 0$. Thus $ne^{j\pi n}$ is not periodic. The same can easily be seen from figure 0.

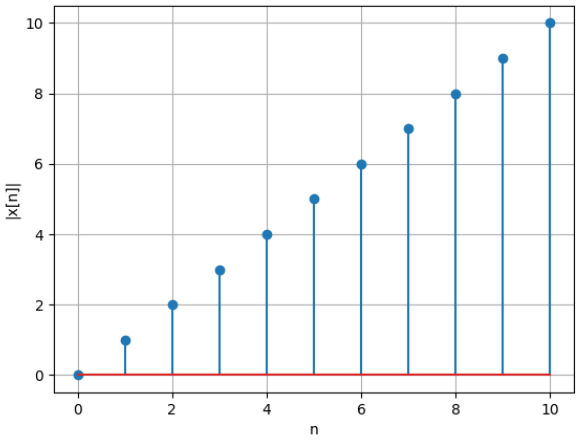

Fig. 0: Amplitude of x[n]

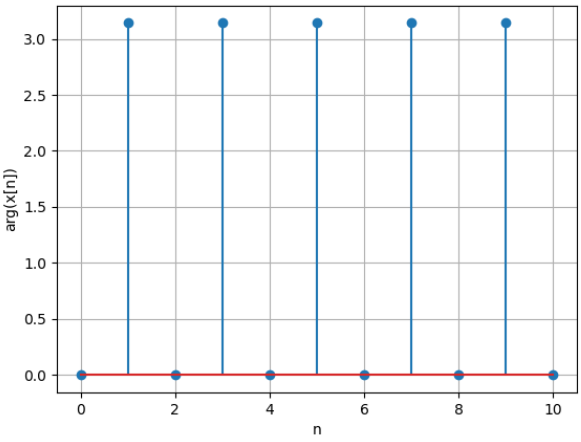

Fig. 0: Phase of x[n]