Discrete Assignment

EE:1205 Signals and Systems

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I. Question 10.5.2.13

How many 3 digit numbers are divisible by 7?

II. Solution

TABLE 1
Input Parameters

Parameter	Used to denote	Values
$x(0)$	First three digit number divisible by 7	$x(0) = 105$
$x(k-1)$	Last three digit number divisible by 7	?
d	Common difference of A.P	$d = 7$
k	Number of 3 digit terms divisible by 7	?

We can use modular arithmetic to determine last three digit number divisible by 7 .

$$x(k-1) \equiv 0 \; (mod\ 7) \tag{1}$$

So we need to find the largest multiple of 7 less than 1000. We can find this by subtracting the remainder when 1000 is divided by 7 from 1000.

$$1000 - (1000 \; mod \; 7) \tag{2}$$

$$= 1000 - 6 \tag{3}$$

$$x(k-1) = 994 \tag{4}$$

Three digit numbers which are divisible by 7 are $105, 112, 119, \ldots, 994$, which form an arithmetic progression (A.P). The number of terms in the AP x(n) is given by:

$$x(n) = (105 + 7n)\, u(n) \tag{5}$$

$$k = \frac{x(k-1) - x(0)}{d} + 1 \tag{6}$$

Using the values in Table 1 :

$$k = \frac{994 - 105}{7} + 1 = 128 \tag{7}$$

Taking z transform of (5) using **??** :

$$X(z) = \frac{105 - 98z^{-1}}{\left(1 - z^{-1}\right)^2} \quad |z| > 1 \tag{8}$$

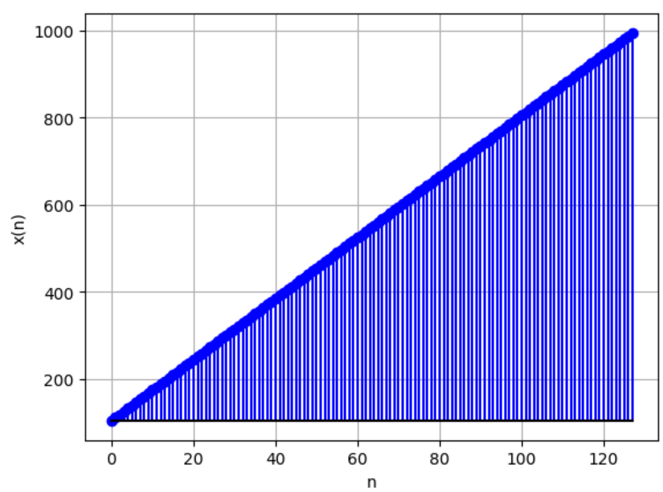

Fig. 1. Plot of $x(n)$