NCERT Discrete - 11.9.1.8

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Question 11.9.1.8:

1) Find the seventh term of the sequence where the nth term is given by $a_n = \frac{n^2}{2^n}$

Solution:

$$x(n) = \frac{n^2}{2^n}u(n) \tag{1}$$

Parameter	Value
$x(n)$	$\frac{n^2}{2^n}$
$x(6)$	?

TABLE 1
INPUT PARAMETERS

Seventh term of the sequence is given by

$$x(6) = \frac{6^2}{2^6} \tag{2}$$

$$x(6) = \frac{36}{64} \tag{3}$$

The Z transform of x(n) is given by

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \tag{4}$$

$$X(z) = \sum_{n=-\infty}^{\infty} \frac{n^2}{2^n}u(n)z^{-n} \tag{5}$$

$$X(z) = \sum_{n=0}^{\infty} \frac{n^2}{2^n}z^{-n} \tag{6}$$

$$X(z) = \sum_{n=0}^{\infty} n^2((2z)^{-1})^n \tag{7}$$

Using differentiation

$$X(z) = \frac{(2z)^{-1}(1+(2z)^{-1})}{(1-(2z)^{-1})^3}; ROC \quad |z| > \frac{1}{2} \tag{8}$$

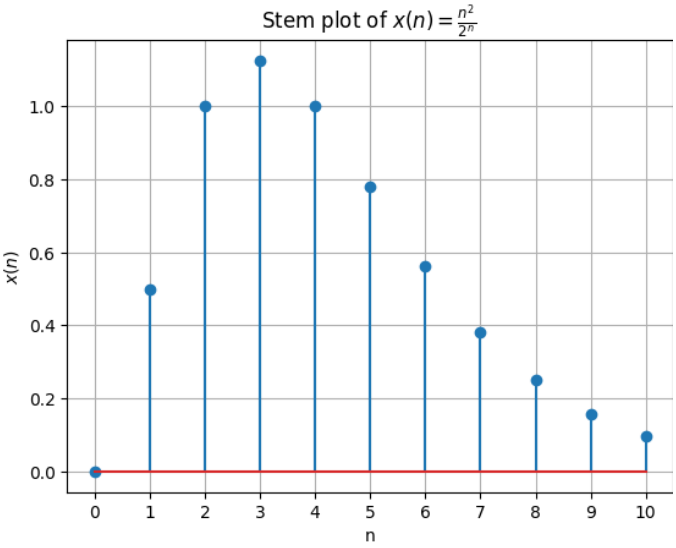

Fig. 1. stem plot of x_n