Discrete Assignment-11.9.1-11

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Problem Statement

Write the first five terms in the sequence:

$$a_0 = 3 \tag{1}$$
$$a_n = 3a_{n-1} + 2 \quad \text{for } n > 0 \tag{2}$$

Solution

Table 1: Input Parameters: First Term and General Formula

Term	**Value**
$x(0)$	3
$x(n)$	$3x(n-1)+2$

So, the first 5 terms of the sequence are $3, 11, 35, 107, 323$.

Difference Equation and Z-transform

The given difference equation is:

$$y(n) = 3y(n-1)x(n-1) - x(n-1) + 3x(n) \tag{3}$$
$$= 3y(n-1)u(n-1) - u(n-1) + 3u(n) \tag{4}$$

$x(n) = u(n)$

Z-transform of the difference equation is:

$$Y(z) = \frac{3z^{-1}Y(z) - z^{-1} + 3}{1 - z^{-1}} \tag{5}$$

$$Y(z) = \frac{2(1 - z^{-1})}{z^{-2} - 2z^{-1} - 2} \tag{6}$$

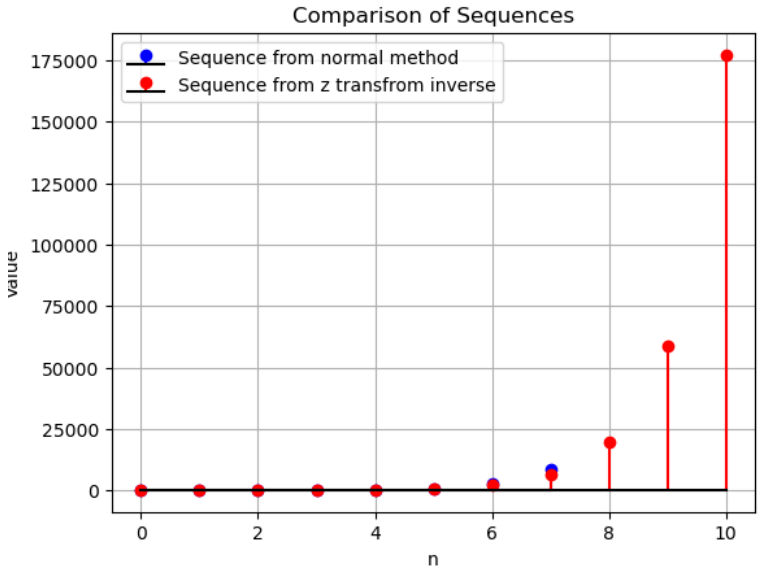

Figure 1: Comparison of Sequences