

NCERT Mathematics 11.9.3 Q32

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Question: If A.M. and G.M. of roots of a quadratic equation are 8 and 5, respectively, then obtain the quadratic equation.

Solution:

Parameter	Description	Value
x_1, x_2	Roots of a quadratic equation	?
$\frac{x_1 + x_2}{2}$	A.M. of roots	8
$\sqrt{x_1 \cdot x_2}$	G.M. of roots	5

TABLE I
INPUT PARAMETERS

$$x_1 \cdot x_2 = 25 \quad (1)$$

$$x_1 + x_2 = 16 \quad (2)$$

$$\Rightarrow x^2 - 16x + 25 = 0 \quad (3)$$

$$\Rightarrow x_1 = 8 + \sqrt{39} \quad (4)$$

$$\Rightarrow x_2 = 8 - \sqrt{39} \quad (5)$$

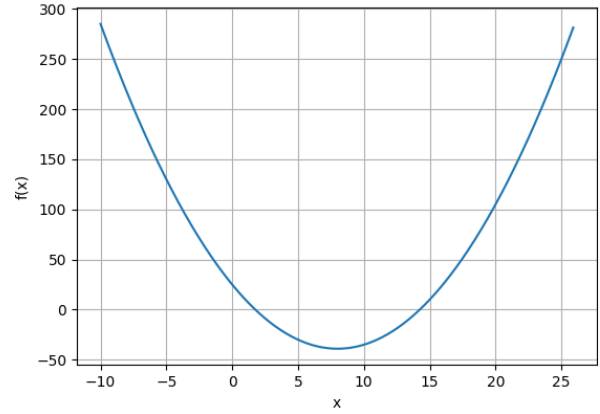


Fig. 1. Plot of $f(x) = x^2 - 16x + 25$

AP : $[x_1, x_2]$

$$x(n) = (8 + \sqrt{39} + n(8 - \sqrt{39}))u(n) \quad (6)$$

$$X(z) = \frac{8 + \sqrt{39}}{1 - z^{-1}} + \frac{(8 - \sqrt{39}) \cdot z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (7)$$

$$\Rightarrow X(z) = \frac{8 + \sqrt{39} - 2\sqrt{39} \cdot z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (8)$$

GP : $[x_1, \frac{x_2}{x_1}]$

$$x(n) = \left((8 + \sqrt{39}) \cdot \left(\frac{8 - \sqrt{39}}{8 + \sqrt{39}} \right)^n \right) u(n) \quad (9)$$

$$X(z) = \frac{103 + 16\sqrt{39}}{8 + \sqrt{39} - (8 - \sqrt{39})z^{-1}} \quad |z| > \frac{103 - 16\sqrt{39}}{25} \quad (10)$$

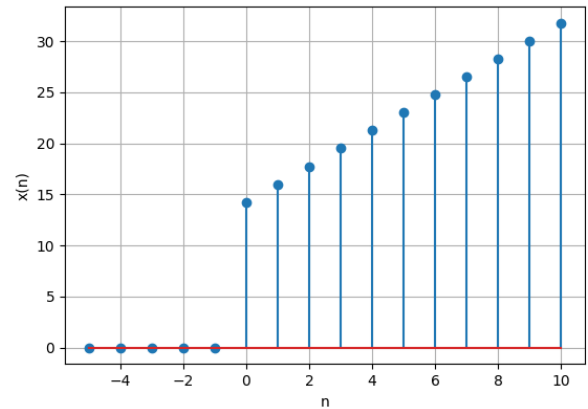


Fig. 2. Plot of $x(n) = (8 + \sqrt{39} + n(8 - \sqrt{39}))u(n)$

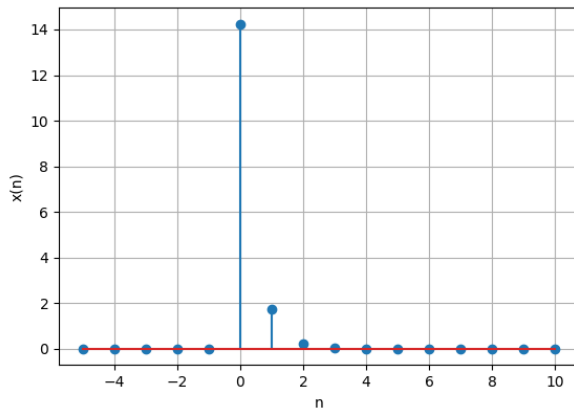


Fig. 3. Plot of $x(n) = \left((8 + \sqrt{39}) \cdot \left(\frac{8 - \sqrt{39}}{8 + \sqrt{39}} \right)^n \right) u(n)$