NCERT DISCRETE 11.9.2.15

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Question: If $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is A.M between a and b, then find value of n.

Solution:

S/No	Symbol	Values	Description
1	$x(0)$	a	First term of A.P
2	$x(1)$	$\frac{a+b}{2}$	A.M of first and third terms of A.P
3	$x(2)$	b	Third term of A.P

TABLE I
PARAMETERS

A.M between any two numbers a and b is average of those numbers.
We represent a, b, A.M of those two in an A.P

$$x(0) = a \tag{1}$$

$$x(1) = A.M = \frac{x(0)+x(2)}{2} \tag{2}$$

$$x(2) = b \tag{3}$$

From (2)

$$\frac{x(0)^n + x(2)^n}{x(0)^{n-1} + x(2)^{n-1}} = \frac{x(0)+x(2)}{2} \tag{4}$$

$$\Rightarrow x(0)^n + x(2)^n = x(2)x(0)^{n-1} + x(0)x(2)^{n-1} \tag{5}$$

$$\Rightarrow x(0)^{n-1}(x(0) - x(2)) = x(2)^{n-1}(x(0) - x(2)) \tag{6}$$

From (6)-

$$n \begin{cases} = 1 & \text{if } x(0) \neq x(2) \\ \in R & \text{if } x(0) = x(2) \end{cases} \tag{7}$$

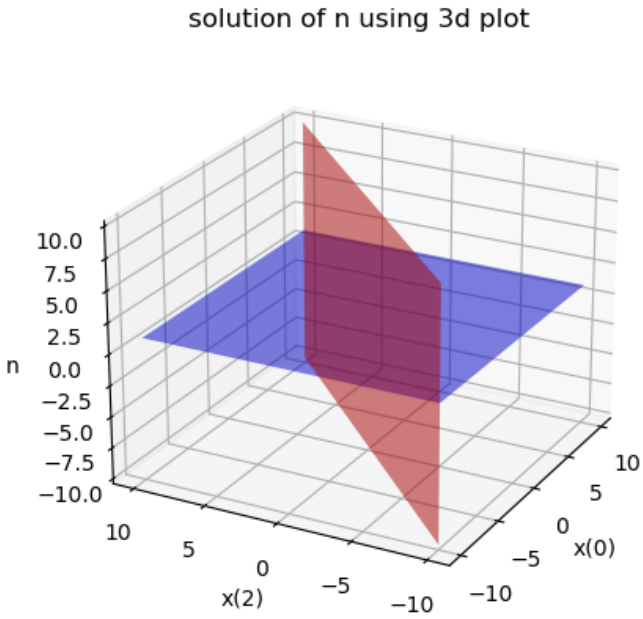

Fig. 1. Plot of n in planes