SJBIR

ISSN: 2319-1422 Vol 10, Issue 5, September, 2021, Impact Factor SJIF 2021 = 7.58

SAARJ Journal on Banking & Insurance Research (SJBIR)

(Double Blind Refereed & Peer Reviewed International Journal)

DOI: 10.5958/2319-1422.2021.00033.3

OBTAINING SOME RESULTS THROUGH EXCHANGES IN REKURENT RELATIONSHIPS AND STUDYING THEIR APPLICATIONS IN SOLVING ISSUES

Kamoliddinov Davlatjon Utkirkhon ugli*

*Student,
Samarkand State University,
UZBEKISTAN

ABSTRACT

As you know,in the field of mathematics, the question of the transition between expressions to a general aspect, based on the links, is defined by several substitutions. In this article, some types of rekurent relations and their application in the field of communication will be studied, and at the same time, methods of solving the issues proposed in many prestigious Olympiads will be presented.

KEYWORDS: *Rekurent Attitude, Sequences, Quadratic Equation.*

INTRODUCTION

An important role is played by the analysis of issues in various fields of mathematics on the basis of one general law. Especially in the theory of sequences, the formation of a formula that expresses the total limit of the sequence has several complexities. In this article, we will come up with several ways to find a recursive relationship, taking into account the processes of formation of the sequence. More precisely, the general expression of a $a_n = f(n)$sequence $a_n = f(n)$consists in the consideration of the application of methods of searching for a formula in the future transition and practical matters .

The article presents various issues and non-standard approaches to them.

First we introduce the concept of dividing some common formulas into types.

Let us be given the following attitude.

$$f_0(n)a_n + f_1(n)a_{n-1} + \cdots + f_r(n)a_{n-r} = g(n)$$

there$f_i(n)$ va $g(n)$variable n is the functions.

If$f_r \neq 0$ va $f_0 \neq 0$, in this case, the r-order is called the rekurent attitude.

If$g = 0$, a linear same-sex rekurent relationship without it is called.

First of all, we study the relationship of the 1-order linear recursive.

(1) $a_n = f(n)a_{n-1} + g(n) \quad n \geq 2 \, , a_1 = \alpha$

There$f(n)$ va $g(n)$functions with variable n and we

$f(n) \neq 0$let's go through the method of finding the general formula for the condition in which we.

First we enter the following auxiliary function.

$p_n = f(1)f(2)f(3) \dots \dots f(n)$and proceeding from this it is possible to write (1) as follows.

$\frac{a_n}{p_n} + \frac{a_{n-1}}{p_{n-1}} = \frac{g(n)}{p_n}$ $va\ agar$ $\frac{a_n}{p_n} = \partial_n$assuming that definition, then

(2) $\partial_n - \partial_{n-1} = \frac{g(n)}{p_n}$comes to view.

If (2) to n:=2,3,4,5…….,n-1,n if we calculate the total sum by putting such numbers.

$\partial_n - \partial_1 = \sum_{r=2}^{n} \frac{g(r)}{p_r}$ (3)

So$\frac{a_n}{p_n} = \partial_n$taking into account the sign (3) write as follows

$\{a_n\}$we can move on to the relationship that characterizes the general had of the sequence.

So, $\partial_n - \partial_1 = \frac{a_n}{p_n} - \frac{a_1}{p_1} = \sum_{r=2}^{n} \frac{g(r)}{p_r} \rightarrow$

$$a_n = p_n\left(\frac{\alpha}{f(1)} + \sum_{r=2}^{n} \frac{g(r)}{p_r}\right) a_1 = \alpha \, , \qquad p_1 = f(1)$$

Now we will come to another rekurent attitude, which is the private status of our method we have studied.

So, we will describe the method of determining the total limit of the 1-ordinal linear, non-homogeneous, unchangeable coefficients recursive relationship.

$a_n = c_1 a_{n-1} + c_2 \ \ n \geq 2 \, , \qquad a_1 = \alpha \quad bu\ yerda\ \ c_1, c_2 \ = const\ va\ c_1 \neq 1$

We perform the following replacement$a_n = b_n + \gamma \, , \gamma = const$

$$b_n + \gamma = c_1 b_{n-1} + c_1 \gamma + c_2$$

$$b_n = c_1 b_{n-1} + (c_1 - 1)\gamma + c_2$$

If we$\gamma = \frac{c_2}{1-c_1}$ $deb\ tanlasak, natijada\ \ b_n = c_1 b_{n-1}$it will look like.

This is the geometric progression and its overall had$b_n = b_1 c_1^{n-1}$

it will look like.

So, $b_n = a_n - \gamma = c_1^{n-1}(\alpha - \gamma) \qquad \rightarrow \qquad a_n = c_1^{n-1}(\alpha - \gamma) + \gamma$

So, 1-we will come up with an orderly non-linear rekurent relationship

$$a_n = \frac{\alpha\, a_{n-1} + \beta}{\gamma a_{n-1} + \delta} \quad bu\, yerda \;\; \alpha\beta\gamma\delta \neq 0, n \geq 2 \qquad \frac{\alpha}{\gamma} \neq \frac{\beta}{\delta}$$

We do the following replacement. $a_n = b_n + x$

$$b_n + x = \frac{\alpha b_{n-1} + \alpha x + \beta}{\gamma b_{n-1} + \alpha x + \delta}(1)$$

(1) From attitude find b_n, we will have the following.

$$b_n = \frac{(\alpha - x\gamma)b_{n-1} + (\alpha x + \beta) - x(\gamma x + \delta)}{\gamma b_{n-1} + \alpha x + \delta}$$

Now in this case we select x as follows. $(\alpha x + \beta) = x(\gamma x + \delta)$

If we find x from this, we need to solve the following quadratic equation. $\gamma x^2 + (\delta - \alpha)x - \beta = 0$ $\quad x = x_1, x_2$

If we select an x_1 root of this equation, we will have the following.

$$b_n = \frac{(\alpha - x_1\gamma)b_{n-1}}{\gamma b_{n-1} + \alpha x_1 + \delta}$$

Or we can write differently as follows

$$\frac{1}{b_n} = \frac{\gamma x_1 + \delta}{(\alpha - \gamma x_1)b_{n-1}} + \frac{\gamma}{(\alpha - \gamma x_1)}$$

And this becomes a simple rekurent relationship, which we consider at the beginning, if we do the following replacements.

$$\frac{1}{b_n} = f_n \qquad => f_n = c_1 f_{n-1} + c_2$$

There $c_1 = \frac{\gamma x_1 + \delta}{(\alpha - \gamma x_1)}$ and $c_2 = \frac{\gamma}{(\alpha - \gamma x_1)}$

We will solve the following wonderful issue with the practical application of the revised rekurent relationship.

Issue 1: *Let's say* $\{a_n\}$ *is a sequence of real numbers, let it have the following conditions.*

$$a_1 = 1\,, a_{n+1} = \frac{1}{16}(1 + 4a_n + \sqrt{1 + 24a_n})$$

$$that\, a_n = f(n)\, determine\ the\ appearance$$

Solution: in order to get rid of the square root,we perform the sign as follows.

$$1 + 24a_n = b_n^2\,,\;\; b_n > 0 \quad => a_n = \frac{b_n^2 - 1}{24}$$

$$a_{n+1} = \frac{1}{16}\left(1 + 4a_n + \sqrt{1 + 24a_n}\right) \;\; => \frac{b_{n+1}^2 - 1}{24} = \frac{1}{16}\left(1 + \frac{1}{6}(b_n^2 - 1) + b_n\right)$$

Simplified the last expression, in case we come to the following.

$4b_{n+1}^2 - 4 = b_n^2 + 6b_n + 5 \quad => \quad 2b_{n+1} = b_n + 3 \;, n \geq 1 \;\; because b_n > 0$

Now in this case$b_n = c_n + \delta$ if we do the replacement, we get the following.

$2(c_{n+1} + \delta) = \; c_n + \delta + 3 <=> 2c_{n+1} = c_n + 3 - \delta$and this is due to the expression$3 = \delta$if we choose as$=> c_{n+1} = \frac{c_n}{2} \quad => c_n = (\frac{1}{2})^{n-1} c_1$

This$b_n = 3 + \frac{1}{2^{n-2}} that's\ easy\ to\ find.$

We find the relationship $a_n = f(n)$required of us as follows

$$b_n{}^2 = (3 + \frac{1}{2^{n-2}})^2 = 9 + \frac{1}{2^{2n-4}} + \frac{6}{2^{n-2}}$$

$=> a_n = \frac{1}{24}(8 + \frac{1}{2^{2n-4}} + \frac{6}{2^{n-2}})$it turns out that.

The issue was resolved.

Let's come up with some great issues to work independently

[1]$If\ \{a_n\} is\ a\ sequence\ of\ real\ numbers, it\ has\ the\ following\ conditions$

$$a_1 = 0\,, \qquad a_{n+1} = \frac{6a_n + 2}{4 - 13a_n}\;.\;\; So\ find\{a_n\}.$$

[2]: $\{a_n\} the\ sequence\ of\ integers\ satisfies\ the\ following\ condition.$

$$-\frac{1}{2} \leq a_{n+1} - \frac{a_n^2}{a_{n-1}} \leq \frac{1}{2} \quad , \;\; a_1 = 2, \;\; a_2 = 7\,. So \quad \forall n \geq in\ 2 \;\; a_n prove\ that\ the\ odd\ consists\ of\ a\ sequence\ of\ numbers.$$

(BMO 1988)

[3]: $\{x_n\} the\ sequence\ is\ defined\ as\ follows$

$x_1 = a\,, x_2 = b \quad and x_{n+2} = 2008x_{n+1} - x_n$. Without it there are such a and b,$\forall n \in N \;\; for \;\; 1 + 2006x_{n+1}x_n there\ will\ be\ a\ full\ square.$

REFERENCES:

1. Bogart K,STEIN, CI,Drysdale R, (2006) Discrete Mathematics for Computer Science. Springer
2. Cormen T, Leiserson CH, Rivest R. (1990) Introduction to Algorithms. The MIT Press, New York.
3. Reingold E, Nievergelt J, Deo N, (1997) Combinatorial Algorithms, Theory and Practice. Prentice – Hall, New Jersey.
4. WA Benjamin. Fillmore, Jay P .; Marx, Morris L. (1968). "Linear Recursive Sequences". SIAM Ed. 10 (3). S. 324–353. JSTOR 2027658.
5. Brousseau, Alfred (1971). Linear recursion and Fibonacci sequences. Fibonacci Association.
6. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, Second Edition. MIT Press and McGraw-Hill, 1990. ISBN 0-262-03293-7.

7. Relapses, pp. 62–90. Graham, Ronald L .; Knuth, Donald E .; Patashnik, Oren (1994). Concrete Mathematics: The Computer Science Foundation (2nd ed.).

8. Addison-Wesley. ISBN 0-201-55802-5. Anders, Walter (2010). Times Applied Econometric Series (3rd ed.)

9. Ming, Tang; Wang To, Tang (2006). "Using Generating Functions to Solve Linear Inhomogeneous Recurrent Equations" (PDF). Proc. Int. Conf. Modeling, Modeling and Optimization, SMO'06. S. 399–404.

10. Relation relation - https://ru.abcdef.wiki/wiki/Recurrence_relation