Review Article

Solution and Attractivity for a Rational Recursive Sequence

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This paper is concerned with the behavior of solution of the nonlinear difference equation $x_{n+1} = ax_{n-1} + bx_n x_{n-1}/(cx_n + dx_{n-2})$, $n = 0, 1, \ldots$, where the initial conditions x_{-2}, x_{-1}, x_0 are arbitrary positive real numbers and a, b, c, d are positive constants. Also, we give specific form of the solution of four special cases of this equation.

1. Introduction

In this paper we deal with the behavior of the solution of the following difference equation:

$$x_{n+1} = ax_{n-1} + \frac{bx_n x_{n-1}}{cx_n + dx_{n-2}}, \quad n = 0, 1, \ldots, \tag{1.1}$$

where the initial conditions x_{-2}, x_{-1}, x_0 are arbitrary positive real numbers and a, b, c, d are positive constants. Also, we obtain the solution of some special cases of (1.1).

Let us introduce some basic definitions and some theorems that we need in the sequel.

Let I be some interval of real numbers and let

$$f : I^{k+1} \longrightarrow I, \tag{1.2}$$