

Abstract

The main goal of this thesis is to study some methods for solving some rational difference equations. We study the solution of rational difference equations basing on some approaches and methods that were studied for some other rational equations.

We mainly study the solution of three difference equations.

The first that we study in this thesis is the rational equation

$$x_{n+1} = \frac{\alpha + \beta x_n + \gamma x_{n-k}}{Bx_n + Cx_{n-k}}, \quad n = 0, 1, \dots \quad (0.0.1)$$

where the parameters $\alpha, \beta, \gamma, B, C$ and the initial conditions $x_{-k}, \dots, x_{-1}, x_0$ are positive real numbers, $k = \{1, 2, 3, \dots\}$.

The second equation that has been studied is

$$x_{n+1} = \frac{ax_n + bx_{n-k}}{A + Bx_{n-k}} \quad (0.0.2)$$

where a, b, A, B are all positive real numbers, $k \geq 1$ is a positive integer, and the initial conditions $x_{-k}, x_{-k+1}, \dots, x_0$ are nonnegative real numbers.

Finally, we study the equation

$$x_n = \frac{A}{x_{n-k}} + \frac{B}{x_{n-3k}}, \quad (0.0.3)$$

where $x_{-3k+1}, x_{-3k+2}, \dots, x_0 \in (0, \infty)$, $A, B > 0$ and $k \in \{1, 2, 3, 4, \dots\}$.