Abstract

In this thesis we will study the qualitative behavior of some difference equations, and we will support our results by numerical discussion using MATLAB 6.5. Our concentration is on invariant intervals, periodic solutions, semicycle analysis, and the global asymptotic stability of all positive solutions of these equations.

We mainly study the positive solutions of the following two difference equations:
The first difference equation is

$$x_{n+1} = Ax_n + \frac{\beta x_n + \gamma x_{n-k}}{Bx_n + Cx_{n-k}} \qquad , n = 0, 1, 2, ... \tag{1}$$

where the initial conditions $x_{-k}, \cdots, x_{-1}, x_0$ are arbitrary positive real numbers and the coefficients A, β, γ, B, C are positive constants, while k is a positive integer number.

The second difference equation is

$$x_{n+1} = Ax_n + \frac{px_n + x_{n-k}}{q + x_{n-k}} \qquad , n = 0, 1, 2, ... \tag{2}$$

where the initial conditions $x_{-k}, \cdots, x_{-1}, x_0$ are arbitrary positive real numbers and the coefficients A, p, q are positive constants, while k is a positive integer number.