

Abstract

The main goal of this thesis is to investigate the boundedness, invariant intervals, semi-cycles and global attractivity of all nonnegative solutions of the equation

$$x_{n+1} = \frac{\beta x_n + \gamma x_{n-k}}{A + Bx_n + Cx_{n-k}}, \quad n = 0, 1, 2, \dots$$

where the parameters β, γ, A, B and C and the initial conditions $x_{-k}, x_{-k+1}, \dots, x_0$ are non-negative real numbers, $k = \{1, 2, \dots\}$.

We give a detailed description of the semi-cycles of solutions, and determine conditions that satisfy the global asymptotically stable of the equilibrium points.

In particular, this monograph is a generalization of the rational difference equation that was investigated in [13].