

Discrete first-order three-point boundary value problem.

ABSTRACT

We study difference equations which arise as discrete approximations to three-point boundary value problems for systems of first-order ordinary differential equations. We obtain new results of the existence of solutions to the discrete problem by employing Euler's method. The existence of solutions are proven by the contraction mapping theorem and the Brouwer fixed point theorem in Euclidean space. We apply our results to show that solutions to the discrete problem converge to solutions of the continuous problem in an aggregate sense. We also give some examples to illustrate the existence of a unique solution of the contraction mapping theorem.

Keyword: Discrete three-point boundary value problem; Contraction mapping theorem; Brouwer fixed point theorem.