1145-39-2981   **Kevin Ahrendt*** (`kahrendt@mines.edu`). *Application of the Contraction Mapping Theorem for existence and uniqueness of solutions to nonlinear, fractional difference boundary value problems.*

We use the Contraction Mapping Theorem to guarantee unique solutions to the nonlinear, fractional difference equation $\nabla \nabla_{a*}^{\nu} x(t) = F(t, x(t-1))$, which is closely related to the self-adjoint differential equation. We develop a general Green's function for the corresponding homogeneous boundary value problem, and go on to find properties of the Green's function in several specific cases, including right-focal boundary conditions as well as conjugate boundary conditions. We utilize these properties with the corresponding integral equation and the Contraction Mapping Theorem to prove the existence and uniqueness of solutions to the appropriate nonlinear, fractional boundary value problems. (Received September 26, 2018)