1086-39-931 **H. Sedaghat*** (hsedagha@vcu.edu). *Solving linear difference equations in rings using reduction of order.*

Linear difference equations may be defined in rings that are not necessarily fields. In this context, one way of studying the solutions of the equation is through reduction of order, via semiconjugate factorization, into linear equations of lower orders. We show that a sufficient condition for this reduction to occur is the existence of a unitary solution for the homogeneous part of the equation. A unitary solution generates an eigensequence (eigenvalues are constant eigensequences) and the eigensequence generates a semiconjugate factorization. We use second-order difference equations whose coefficients may be variable or constant to illustrate and to apply various results. For instance, we show how to obtain new formulas for classical special functions that satisfy linear recurrences in a ring of real-valued functions (e.g., modified Bessel functions). (Received September 16, 2012)