1086-G5-1698 **Karsten K. Schmidt*** (kschmidt@fh-sm.de). *Teaching Matrix Algebra with Magic Squares.*
A magic square of order n is a square arrangement of nn real numbers, such that the sums of the elements in each row, column, and diagonal are equal to a constant s, its magic sum. If an nxn matrix M denotes a magic square, and j denotes an nx1 vector of ones, the following activities can be carried out in class (if possible, using technology to simplify calculations): computing the matrix product Mj and comparing it to the scalar product sj to check whether the n row sums are indeed equal to s; computing the trace of M to check whether the sum of the elements of the main diagonal is equal to s; reconsidering the equation Mj = sj to discover that s is one of the eigenvalues, and j an associated eigenvector, of M. Any 3x3 magic square can be written as the sum of two matrices, M = sG + N, where G = 1/3J (J=jj' denotes the 3x3 matrix of ones), and also N has a simple structure defined by only two real numbers. The matrices G, N, and M provide good examples to compute the trace, determinant, rank, and eigenvalues, and investigate the connections between them. A further interesting activity is to compute the (Moore-Penrose) inverse of M, and investigate whether it is also magic. The Lo-Shu magic square (4,9,2;3,5,7;8,1,6) will be the example used in the presentation. (Received September 24, 2012)