Abstract. A linear operator on a Hilbert space may be approximated with finite matrices by choosing an orthonormal basis of the Hilbert space. For an operator that is not compact such approximations cannot converge in the norm topology on the space of operators. Multiplication operators on spaces of L_2 functions are never compact; for them we consider how well the eigenvalues of the matrices approximate the spectrum of the multiplication operator, which is the essential range of the multiplier. The choice of the orthonormal basis strongly affects the convergence. Toeplitz matrices arise when using the Fourier basis of exponentials $\exp(ik\theta)$. We also consider the basis of Legendre polynomials and the basis of Walsh functions.