

# Numerical Work of Hans F. Weinberger

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**Abstract** In this talk we will survey several papers (listed below) by Hans Weinberger dealing with numerical and approximation issues. We have divided them into three categories: (i) approximation of eigenvalues; (ii) approximation theory issues; and (iii) error bounds for iterative methods for matrix inversion.

The seven papers listed are only a small part of Hans' work—but they were very influential. We, of course, cannot discuss any of these papers in detail, but will instead concentrate on those results that are especially insightful and elegant.

## References

### Approximation of Eigenvalues

- [1] Upper and lower bounds for eigenvalues by finite difference methods. Communications on Pure and Appl. Math. 9 (1956), pp. 613-623.
- [2] Lower bounds for higher eigenvalues by finite difference methods. Pacific J. Math. 8 (1958), pp. 339-368.

### Approximation Theory Issues

- [3] Optimal approximations and error bounds (joint with M. Golomb). In Proc. Symposium on Numerical Approximation, Univ. of Wisconsin Press, 1959, pp. 117-190.
- [4] Optimal approximation for functions prescribed at equally spaced points. Nat. Bureau of Standards J. of Research 65B, 2 (1961), pp. 99-104.
- [5] On optimal numerical solution of partial differential equations. SIAM J. Numer. Anal. 9 (1972), pp. 182-198.
- [6] Optimal numerical approximation of a linear operator. Linear Alg. and its Appl. 52/53 (1983), pp. 717-737.

### Error Bounds for Iterative Methods for Matrix Inversion

- [7] A posteriori error bounds in iterative matrix inversion. In Numerical Treatment of Partial Differential Equations, Academic Press 1965, pp. 153-163. Proceedings of Symposium on Numerical Solution of Partial Differential Equations, held at the Univ. of Maryland in 1965 (Edited by J. Bramble).