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THE EIGENVALUES AND EIGENFUNCTIONS  
OF THE ELLIPTICAL MEMBRANE

E. ISAACSON, J. B. KELLER, G. LOGEMANN

We have used an iterative method to solve the ordinary differential equation system (in elliptical coordinates) which determines the eigenvalues and eigenfunctions of the elliptically shaped membrane, for any eccentricity,  $e$ , of the ellipse. The initial guess is obtained from an asymptotic expansion obtained earlier by J. B. KELLER and S. I. RUBINOW [1].

We solve an initial value problem and use Newton's iteration scheme to fit the proper boundary conditions. The variational (differential) equations are also integrated numerically to provide the partial derivatives required in Newton's method.

A variational expression for the eigenvalues is then evaluated as an independent check on the accuracy of the calculations. A complete description of this work together with a table of eigenvalues will be submitted to Mathematics of Computation.

*Reference*

- [1] J. B. Keller and S. I. Rubinow: Asymptotic Solution of Eigenvalue Problems, *Annals of Physics*, Vol. 9, №. 1, Jan. 1960, pp. 24—75. Errata: *Annals of Physics*, Vol. 10, No. 2, June 1960, pp. 303—305.

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