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COMMENTS ON "ON THE POLYGONAL MEMBRANE WITH A CIRCULAR CORE"

P. A. A. LAURA AND S. A. VERA
Institute of Applied Mechanics (CONICET) and Departments of Engineering and Physics, Universidad Nacional del Sur, 8000 Bahía Blanca, Argentina

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The writers wish to congratulate the author for his interesting results [1]. With regards to disagreement between the results obtained in reference [1] and those presented in reference [2], the writers would like to clarify the following points.

(1) *The case when the fixed center core is large*. It was clearly stated in reference [2] that the approximate conformal mapping approach is valid as long as $R_0/a<1$. Clearly the approximation is rather crude when b (following the notation presented in reference [1]) is equal to 0·9. Admittedly Figures 4 through 8 of reference [2] contain a drafting error since the plots were drafted up to 0·9.

The first writer sincerely apologizes for this error for which he became aware through Wang's excellent study [1]. The same error occurs in Table 3 [2]. Apparently the accuracy of the results presented in reference [2] is acceptable for $b<0{\cdot}6$. For larger values of b the co-ordinate functions used in reference [2] yield very high upper bounds. Besides, the azimuthal dependence of the mode shapes should be taken into account when b is large.

(2) *The case when the fixed center core is very small* (*approaching zero*). Wang concludes [1] that "if the constraint size is infinitesimally small, the frequency is surprisingly the same as the unconstrained membrane". This, indeed, is a very surprising fact. Professor Wang has provided a very ingenious proof of this fact which, apparently, is also valid for higher eigenvalues, at least in the case of a circular membrane with a central, point support.

Table 1 depicts a series of numerical experiments performed by the writers which show the variation of the first three roots of the equation

$$Y_0(k)J_0(k\varepsilon)-J_0(k)\,Y_0(k\varepsilon)=0, \qquad (1)$$

as ε decreases its value from 0·1 to 10^{-1000}. The calculations have been greatly facilitated by the use of MAPLE [3].

The values depicted in Table 1 show a definite trend approaching the exact values of the roots of the equation

$$J_0(k)=0. \qquad (2)$$

Clearly the co-ordinate functions used in reference [2] yield extremely high upper bounds in the case of a central, point support.

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TABLE 1

Values of k in equation (1) as a function of $\varepsilon = 10^{-m}$

Value of m	k_1	k_2	k_3
1	3·313938	6·857579	10·377420
2	2·800921	6·010900	9·214165
3	2·654814	5·808977	8·967657
4	2·587120	5·723600	8·869826
5	2·548210	5·676952	8·818144
6	2·522968	5·647636	8·786318
7	2·505276	5·627527	8·764782
8	2·492189	5·612885	8·749249
9	2·482118	5·601749	8·737522
10	2·474127	5·592997	8·728355
11	2·467634	5·585937	8·720994
12	2·462252	5·580122	8·714954
13	2·457720	5·575251	8·709908
14	2·453851	5·571110	8·705630
15	2·450509	5·567547	8·701957
16	2·447594	5·564449	8·698769
17	2·445028	5·561730	8·695976
18	2·442753	5·559325	8·693510
19	2·440721	5·557183	8·691315
20	2·438896	5·555262	8·689350
1000	2·405495	5·520758	8·654409
Exact values	2·4048256	5·5200781	8·6537279

An experimental program will be performed by the writers in order to test the validity of present, analytical results.

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