excellent reference for hypersonic viscous effects which can be treated with boundary-layer theory (Chapters VIII and IX).

Chapter X gives a very complete qualitative discussion of the general features of rarefied gas flows, covering the gamut from low Reynolds number continuum flow to free molecule flow. For the free molecule flow regime, results for forces and heat transfer are given.

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55[V, X].—Charles J. Thorne, George E. Blackshaw & Ralph K. Claassen, *Steady-State Motion of Cables in Fluids, Part I., Tables of Neutrally Buoyant Cable Functions*, NAVWEPS Report 7015, Part 1 NOTS TP 2378, China Lake, California, 1962, xxxii + 400 (approx.) unnumbered pages, 22 cm.

An approximate solution for the shape and tension of a neutrally buoyant flexible cable in a stream is expressible in terms of the functions

$$\tau = \exp\left(\frac{F}{R}\cot\phi\right), \qquad \xi = \int_\phi^{\pi/2} \tau \cot\phi \csc\phi \, d\phi, \qquad \eta = \int_\phi^{\pi/2} \tau \csc\phi \, d\phi$$

where $R/F = 45$. A brief table of these functions was given by Landweber and Protter (*Jour. Appl. Mech.*, 1947). In the present work these functions are tabulated for much smaller increments of the variable. Various combinations of these functions that are useful in solving certain types of cable problems are also tabulated.

Since the assumed laws of the forces on a cable are empirical and approximate, it is interesting to observe that by a slight alteration in the physical assumptions, due to R. K. Reber of the Navy Department, Bureau of Ships, the differential equations can be made integrable. Assuming that, instead of a constant tangential component, there is a constant force F per unit length in the downstream direction, the differential equations (5) and (6) in the book would be replaced by

$$\frac{dT}{ds} = F\cos\phi$$

$$T\frac{d\phi}{ds} = -R\sin^2\phi - F\sin\phi$$

It is readily verified that the functions corresponding to ξ and η obtained from these differential equations are exactly integrable. This has the obvious advantage of enabling neutrally buoyant cable problems to be solved with the aid of trigonometric tables.

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56[X].—Charles Andersen, "The Ruler Method, An Examination of a Method for Numerical Determination of Fourier Coefficients," *Acta Polytechnica*

Scandinavica, Mathematics and Computing Machinery Series, No. 8, Copenhagen, 1963, 73 p., 25 cm. Price Sw. Kr. 10.00.

Let $f(x)$ be given graphically on the closed interval $(0, 2\pi)$. Required are the Fourier coefficients; for example, a_n, where $f(x) = \sum_{n=0}^{N} a_n \cos nx$, and $a_n = (\frac{1}{2}n) \sum_{s=1}^{2n} f(x_s) \cos (s\pi/n)$. The idea is to have a set of rulers so graduated as to facilitate location of x_k.

There is a discussion of the relation between a_n and $A_n = (1/n\pi) \int_0^{2\pi} f(x) \cos nx \, dx$.

Y. L. L.

57[X].—G. E. Uhlenbeck & G. W. Ford, "The theory of linear graphs with applications to the theory of the virial development of the properties of gases", Appendices 2, 3, 4, Le Boer & Uhlenbeck, editors, *Studies in Statistical Mechanics, Volume I*, North-Holland Publishing Company, Amsterdam, 1962, p. 199–211.

Three tables concerning graphs are given in the appendices of the monograph above.

For $p = 4(1)7$ and $k = 0(1)\frac{1}{2}p(p - 1)$, Appendix 2 lists the number of graphs with p points and k lines of the following six types: $N_{p,k}$ = labeled graphs; $C_{p,k}$ = labeled connected graphs; $S_{p,k}$ = labeled stars; $\pi_{p,k}$ = free graphs; $\gamma_{p,k}$ = free connected graphs; and $\sigma_{p,k}$ = free stars.

The interesting Appendix 3 shows diagrams of each topologically distinct connected graph for $p = 2(1)6$ and $k = p - 1\ (1)\frac{1}{2}p(p - 1)$. For each of these there is given n, the number of such graphs if they were labeled; d, the so-called "complexity" (an invariant of the graph matrix); and finally a symbolic designation of the corresponding graph group. For p and k fixed the number of topologically distinct graphs is the quantity $\gamma_{p,k}$ above, while the sum of the corresponding values of n is the quantity $C_{p,k}$ above. (There is an error in the first graph for $p, k = 6, 7$; the leftmost vertical line should be deleted).

Appendix 4 lists $n(p, k, d)$ for $p = 2(1)7$, $k = p - 1\ (1)\frac{1}{2}p(p - 1)$ and all pertinent values of d. This is obtained by adding the values of n for all graphs with the same values of p, k, and d.

Besides the physical application indicated in the title, the monograph contains a certain amount of graph theory, defining the above concepts and quantities and giving formulas. On page 197 is an unproved conjecture concerning the asymptotic behavior of $n(p, k, d)$.

D. S.

58[X].—J. G. Herriot, *Methods of Mathematical Analysis and Computation*, John Wiley & Sons, New York, 1963, xiii + 198 p., 24 cm. Price $7.95.

This is the first volume in a series on spacecraft structures, and is intended to present the mathematical methods that are most useful to structural engineers. The emphasis is on numerical methods, and the contents run over a small gamut of topics from interpolation to partial differential equations. The exposition is simple, and, since the author avoids involvement with knotty questions, the