VI. Substitutions linéaires, formes quadratiques et transformations rationnelles.
VII. Calcul matriciel
VIII. Equations dont les racines sont dans un cercle ou un demi-plan. Critères de stabilité.
IX. Notion sur les groupes et sur l'algèbre abstraite.
Appendice Sur les determinants de Hurwitz et la séparation des racines complexes des équations à coefficients réels.

E. I.

93[H, X].—MINORU URABE, HIROKI YANAGIWARA & YOSHITANE SHINOHARA, "Periodic solutions of van der Pol's equation with damping coefficient $\lambda = 2 \sim 10$," reprinted from the *J. Sci. Hiroshima Univ., Ser. A*, v. 23, No. 3, March 1960.

The periodic solution of van der Pol's equation

$$\frac{d\chi^2}{dt^2} - \lambda(1 - \chi^2)\frac{d\chi}{dt} + \chi = 0$$

is tabulated for $\lambda = 2, 3, 4, 5, 6, 8, 10$. For each λ a four-decimal-place listing of the function $\chi(t)$ and the function

$$y(t) = \begin{cases} \dfrac{d\chi}{dt} & \text{for} \quad \lambda \leq 4 \\[2ex] \dfrac{d\chi}{dt}\Big/\lambda & \text{for} \quad \lambda \geq 5 \end{cases}$$

is given for the range $T_1(a) \leqq t \leqq T_2(a)$, where a is the initial positive amplitude of the periodic solution normalized so that at $t = 0$, $\frac{d\chi}{dt} = 0$; and where $T_2(a)$ is the smallest positive time at which $\chi = 0$, while $T_1(a)$ is the largest negative time at which $\chi = 0$.

Since the periodic solution corresponds to a closed curve in the (χ, y) plane which is symmetric with respect to the origin, the above tabulation is sufficient.

For $\lambda \geq 5$, an additional three-decimal-place tabulation of $\frac{d\chi}{dt}$ is given.

The interval size in t depends on λ and on the value of t as in the following table:

λ	$t > 0$	$t < 0$
2	.05	.025
3, $\cdots$, 8	.025	.0125
10	0.0(.0125)0.2 0.2(.025)9.0 9.0(.0125)9.25	.00625

Each table includes a listing of the same quantities at $t = T_1(a)$ and $t = T_2(a)$. Furthermore, four-decimal values of the amplitude a, the period $\omega =$

$2[T_2(a) - T_1(a)]$, and the characteristic exponent h are given for each λ. If we set

$$h(t) = \lambda \int_0^t (1 - \chi^2)\, dt, \qquad \text{then} \quad h = h(\omega)/\omega.$$

For each λ there is a plot of the hodograph $\left(\chi, \frac{d\chi}{dt}\right)$ and the curve $\chi(t)$ (including $\lambda = 0, 1$). An additional graph depicts a, ω, and h as functions of λ in the interval [0, 10].

E. I.

94[M, P, S].—R. L. MURRAY & L. A. MINK, *Tables of Series Coefficients for Burnup Functions*, Bulletin No. 71, Department of Engineering Research, N. C. State College, Raleigh, N. C., May 1959, 82 p., 28 cm. Price $1.50.

In a certain model, calculation of nuclear reactor properties under long-term operation requires the evaluation of

$$A_0 = \overline{\varphi^{(l)}} \left[\frac{1}{\delta_z\, \pi/2} \int_0^{\delta_z \pi/2} (\cos x)^l\, dx\right]\left[\frac{2}{(\delta_r\, j_0)^2} \int_0^{\delta_r j_0} x[J_0(x)]^l\, dx\right],$$

$$a_0 = \frac{\overline{\varphi^{(l+1)}}}{\overline{\varphi^{(l)}}}, \quad A_1 = \frac{1}{2}\left[\frac{\overline{\varphi^{(l+2)}}}{\overline{\varphi^{(l)}}} - a_0^2\right]$$

and some other combinations of $\overline{\varphi^{(l)}}$. Here j_0 is the smallest positive zero of $J_0(x)$. All functions are tabulated for the range $l = 0(1)4$, δ_i, $\delta z = 0.50(0.05)0.60(0.02)1.0$. A_0 and a_0 are given to 7D; A_1 to 6D, and the remaining functions not listed here are given with less accuracy. Similar tables are given for the function

$$A_0 = \frac{3}{(\delta\pi)^3} \int_0^{\delta\pi} x^2 \left(\frac{\sin x}{x}\right)^l dx.$$

The method of computation is not explained, nor is j_0 defined. We infer the definition of j_0 from physical considerations corroborated by numerical evaluation. Spot checks indicate the entries are accurate to the number of places given.

Y. L.

95[W, X].—RUSSELL L. ACKOFF, Editor, *Progress in Operations Research*, Vol. 1, John Wiley & Sons, Inc., New York, 1961, 505 p., 23 cm. Price $11.50.

Each chapter of this book is written by different authors. It treats recent progress in some of the methodological fields of operations research, such as linear programming, in an outstanding manner, scantily discussing progress in others, such as queuing theory.

The introductory chapter, written by the editor of the book, is excellent. He points out that in other well-established scientific fields one is not as concerned about definitions as those in operations research have been, that this field is now accepted and has acquired the confidence of workers in other fields, and that, as a result, there is less craving for definitions.

An interesting chapter by Churchman on contributions to decision and value theory then follows. Hanssmann's chapter on inventory theory leaves much to be desired and is not saved even by attempting to justify the presentation in an opera-