Vítězslav Novák; Bedřich Půža
Sixty years of Professor Miloš Ráb

SIXTY YEARS OF PROFESSOR MILOŠ RÁB

Vítězslav Novák, Bedřich Půža, Brno

Those who had not met Prof. Ráb personally would hardly believe that this slim man of youthful and athletic looks has become sexagenarian. Nevertheless, for all members of the Czechoslovak mathematical community this is a fact: Professor RNDr. Miloš Ráb, DrSc., former head of Department of Mathematical Analysis of the Faculty of Science of J. E. Purkyně University and one of the leading personalities of the mathematical life in Brno, has reached sixty years of age on 30 September 1988.

Miloš Ráb was born in the village Újezd near Brno. After his secondary school final examination he entered Faculty of Science of Masaryk University (now J. E. Purkyně University) in Brno to study mathematics and descriptive geometry. In 1951 he finished his studies by passing the state examination in Mathematics and Descriptive Geometry. Still as a student (from 1950) he was Assistent at Technological University in Brno, later School of Civil Engineering. In 1952 he joined Department of Mathematics, Faculty of Science of Brno University, with which he has been ever since (in 1962 the department was divided into three, and Prof. Ráb became member of staff of the Department of Mathematical Analysis). Since 1955 M. Ráb was a research student (aspirant) under the guidance of Prof. Borůvka, defending in 1957 his thesis "Oscillatory and asymptotic properties of integrals of the linear differential equation of the 3rd order" and receiving his Candidate of Science degree. In 1961 he was appointed Associate Professor (Dozent) of Mathematics. The degree of Doctor of Science he received on the basis of his work "Asymptotic formulas for solutions of ordinary differential equations" in 1967, and in 1969 he became Full Professor of Mathematics; a year later he was appointed Head of Department of Mathematical Analysis, an office he held for sixteen years (till 1986).

Professor Ráb is an outstanding personality of mathematical life in Czechoslovakia. His scientific activity has been directed to the qualitative properties of linear differential equations, especially the oscillatory and asymptotic properties of their solutions. His first works dealt with linear differential equations of the 3rd order, in particular with the problem how to describe their properties in terms of integrals of equations of lower orders. Then he focused his attention on the linear differential equations of the 2nd order. In connection with this research he developed a general method based on the transformation theory of Prof. Borůvka and the method of perturbations. The methods he had discovered have made it possible

to clear up a number of important problems concerning linear differential equations of the 2nd order. For example, M. Ráb established a necessary and sufficient condition for a solution to be oscillatory, which provided a unified approach to almost all results from the field known at that time, allowed to assess the comparison criteria

for oscillatoricity, and deduce a number of other results of permanent importance. Similarly, Ráb reached excellent results also when studying the asymptotic properties of solutions of differential equations. Also these results are of unifying character and their essential feature is the possibility of very accurate estimates of the approximation of a solution with the help of asymptotic formulas. Prof. Ráb is still faithful to the problems of asymptotic behavior of solutions, having extended his results on the one hand to differential equations with complex coefficients, on the other to twodimensional systems of differential equations. He succeeded in constructing very suitable Ljapunov functions, which facilitate the detailed analysis of trajectories of the above mentioned equations.

Prof. Ráb has always been attracted to scientific problems of immediate importance, and his results have regularly found considerable response of mathematical community in Czechoslovakia and abroad. His results have been cited in many mathematical papers and monographs on differential equations, and he has reported on them at various universities and conferences. He has rich contacts with prominent scientists throughout the world, including cooperation in research as well as informal personal friendship. In connection with the research project "Limit properties of differential equations", whose leader he has been for several decades, he has organized a seminar regularly attended by numerous mathematicians from Brno and nearby cities. He has been superviser of a number of doctoral dissertations, and many present research workers had started their scientific career in his seminar.

Pedagogical activity is an inseparable part of Prof. Ráb's scientific profile. He considers himself first of all a university teacher, and we have to add, a really outstanding one. M. Ráb has the not quite current gift of being able to captivate and inspire his students by his way of lecturing and all his personality. If we add his high scientific level and ability of grasping the substance of each problem, we obtain the paragon of a first-class teacher of mathematics, the need for (and lack of) which seems to be everlasting.

Repeated re-editions of five volumes of lecture notes, whose author Prof. Ráb is, prove both their quality and popularity. At present, he leads a group of authors preparing an all-state textbook of mathematical analysis for institutions of higher education, intended for future mathematics teachers. The picture of Prof. Ráb's manysided activities would not be complete without mentioning his offices in organization of research and education, membership in committees, scientific and editorial boards etc. For his merits he received several medals and other distinctions.

Czechoslovak mathematicians highly appreciate the work Prof. Ráb has done in research, education and organization of science, and on the occasion of his 60th birthday extend to him sincere wishes of further successes and personal happiness.

LIST OF PUBLICATIONS OF MILOŠ RÁB

[1] Oscillation properties of integrals of the linear differential equation of the third order (Czech), Práce brněnské základny ČSAV, *XXVII* (1955), 349—360.
[2] Asymptotische Eigenschaften der Lösungen linearer Differentialgleichung dritter Ordnung, Spisy přír. fak. *374* (1956), 177—184.
[3] Asymptotic properties of integrals of the linear differential equation of the third order, Spisy přír. fak. *379* (1956), 441—454.
[4] Note to the problem of oscillatory properties of solutions of the differential equation $y'' + A(x)\,y = 0$, Čas. pěst. mat. *82* (1957), 342—348.
[5] Über lineare Perturbationen eines Systems von linearen Differentialgleichungen, Czech. Math. J. *8 (83)* (1958), 222—229.
[6] On the differential equation $y''' + 2\,A(x)\,y' + A'(x) + W(x)\,y = 0$, Mat. fyz. čas. SAV, *VIII* (1958), 2, 115—122.

[7] Asymptotische Eigenschaften der Lösungen der Differentialgleichung $y'' + A(x)\,y = 0$, Czech. Math. J. *8 (83)* (1958), 513—519.

[8] Kriterien für die Oszillation der Lösungen der Differentialgleichung $[p(x)\,y']' + q(x)\,y = 0$, Čas. pěst. mat. *84* (1959), 335—370.

[9] On a certain generalization of Sansone's theorem on non-oscillation of integrals of the differential equation $y''' + 2\,A(x)\,y' + [A'(x) + \omega(x)]\,y = 0$ (Czech), Mat.-fyz. čas. *X* (1960) 1, 3—8.

[10] Asymptotische Eigenschaften von Lösungen der Differentialgleichung $y'' = A(x)\,y$ im nichtoszillatorischen Fall, Czech. Math. J. *10 (85)* (1960), 501—522 (with *J. Mařík*).

[11] Nichtoszillatorische lineare Differentialgleichungen 2. Ordnung, Czech. Math. J. *13 (88)* (1963), 209—225 (with *J. Mařík*).

[12] Asymptotic Formulas for the Solutions of Linear Differential Equations of the Second Order, Proceedings of the Conference held in Prague in September 1962, 131—135.

[13] Asymptotische Formlen für die Lösungen der Differentialgleichung $y'' + q(x)\,y = 0$, Czech. Math. J. *14 (89)* (1964), 203—221.

[14] Les formules asymptotiques pour les solutions d'un système des équations différentielles, Arch. Math. (Brno) *1* (1965) 3, 199—212.

[15] Note sur les formules asymptotiques pour les solutions d'un système des équations différentielles linéaires, Czech. Math. J. *16 (91)* (1966), 127—129.

[16] Les développements asymptotiques des solutions de l'équation $(py')' + qy = 0$, Arch. Math. (Brno) *1* (1966) 1, 1—17.

[17] Sur les formules asymptotiques concernant les solutions d'un système des équations différentielles linéaires, Colloquium Mathematicum, *XVIII* (1967), 67—71.

[18] Asymptotic Formulas for the Solutions of the Equation $(py')' + qy = 0$, Acta Fac. Rerum Univ. Comenianae Mathematica *XVII* (1967), 217—220.

[19] Asymptotic Formulas for the Solutions of a System of Linear Differential Equations $y' = [A + B(x)]\,y$, Czech. Math. J. *94* (1969), 78—83.

[20] The Riccati Differential Equation with Complex-Valued Coefficients, Czech. Math. J. *20 (95)* (1970), 491—503.

[21] On the Existence of Solutions of Certain Nonlinear Equations Occurring in the Transformation Theory of a Linear Second Order Differential Equation with Complex-Valued Coefficients, Arch. Math. (Brno), *6* (1970), 75—78.

[22] Equation $Z' = A(t) - Z^2$ Coefficient of Which has a Small Modulus, Czech. Math. J. *21 (96)* (1971), 311—317.

[23] Periodic Solutions of $\ddot{x} = f(x, \dot{x})$, Proceedings of EQUADIFF III, Brno 1972, 127—138.

[24] Asymptotic Expansions of Solutions of the Equation $[p(x)']' - q(x)\,y = 0$ with Complex-Valued Coefficients, Arch. Math. (Brno), *VIII* (1972), 1—15.

[25] Second Order Differential Equations with Complex-Valued Coefficients, Czech. Math. J. *22 (97)* (1972), 590—599.

[26] Asymptotic Relationships between the Solutions of Two Systems of Differential Equations, Annales Polon. Math. *XXX* (1974), 119—124.

[27] Asymptotic Formulas for Solutions of the Equation $[p(t)\,y']' = q(t)\,y + r(t)$, Arch. Math. (Brno), *X* (1974), 79—86.

[28] A Note on the Asymptotic Integration of a Nonlinear System of Differential Equations, Knižnice odb. a věd. spisů VUT v Brně, B-56 (1975), 151—156.

[29] Asymptotic Behaviour of the Equation $x'' + p(t)\,x' + q(t)\,x = 0$ with Complex-Valued Coefficients, Arch. Math. (Brno), *XI* (1975), 193—204.

[30] Bounds for Solutions of the Equation $[p(t)\,x']' + q(t)\,x = h(t, x, x')$, Arch. Math. (Brno), *XI* (1975), 79—84.

[31] Global Properties of a Riccati Differential Equation, University Annual Applied Mathe-

matics, XI (1975), Book 1, 165—175. (Conference on differential equations and application in Russe 1975).

[32] Geometrical Approach to the Study of the Riccati Differential Equation with Complex-Valued Coefficients, J. Diff. Eq. *25* (1977), 108—114.

[33] Linear Integral Inequalities, Arch. Math. (Brno) *XV* (1979) 37—46.

[34] Linear Differential Equation of the 2nd Order Whose Principal Solution Has Unbounded Logarithmic Derivative, Arch. Math. (Brno) *XVII* (1981), 91—94.

[35] Asymptotic Formulas for Solutions of the Differential Equation with Advanced Argument $(x'(t)/r(t))' + q(t)f(x(g(t))) = 0$, Arch. Math. (Brno) *23* (1987), 45—52.