MATHEMATICS

Irving Burr, Purdue University, was elected chairman for 1958

ABSTRACTS

Class Administration in Courses Using a Textbook. G. H. Graves, Valparaiso University.—Purposes of the class meeting are: to further the student's mastery of his material and to increase his ability to gain results from study. Hence the first order of business is to answer his questions. Other students should ordinarily do this. Sarcasm is never permitted but plain speaking may be necessary, such as, "The teacher has no responsibility for the student who does not study." In courses where a textbook is used, there should be no lectures and note taking should be discouraged as it detracts from the mental concentration required to follow a discussion. For testing and records, seat work has many advantages which home work handed in and board work do not.

The Mathematics of the Future. P. D. Edwards and Charles Brumfiel, Ball State Teachers College.—Professor Edwards emphasized the increasing importance of having high school teachers of mathematics who are much more thoroughly trained in advanced mathematics than was considered necessary a relatively few years ago. This applies not only to the traditional topics needed by the engineer and physical scientist but also to the needs of workers in other fields. It is felt that very definite improvements in the preparation may be made by drastic changes in the content of high school mathematics. Professor Brumfiel made a progress report on an experimental program now being supervised by Ball State which was made possible by a grant of the National Science Foundation.

A Characterization of N–adic Equivalence Relations. J. L. Lawrence, Wabash College.—The concepts of symmetry, transitivity, composition, and equivalence associated with dyadic relations are generalized to apply to the n–adic case. In the generalized scheme, symmetry and transitivity persists as a necessary and sufficient condition for an n–adic relation to be an equivalence relation. Furthermore, as in the dyadic case, a n-adic relation is transitive if and only if the relation contains the composition of the relation with itself.

The Concept of Surface Integral. Lincoln H. Turner, Purdue University.—A continuous parametric surface (T, A) is a continuous mapping T from a subset A of E_2 into three space E_3, $p = T(w)$, $w = (u,v)$ εA, $p = (x,y,z)$ εE_3. The usual definition of area in terms of the Jacobians of the mapping is inadequate in modern analysis. An adequate definition was given by Lebesgue in terms of sequences of polyhedral mappings which approach the original mapping. When the area is finite,

four measures φ, V_1, V_2, V_3 may be defined by means of these sequences on a certain ring of Borel subsets of A such that V_1, V_2, V_3 are absolutely continuous with respect to φ. The Radon-Nikodym derivatives

$$\theta_1(w) = \frac{dV_1}{d\varphi}, \quad \theta_2(w) = \frac{dV_2}{d\varphi}, \quad \theta_3(w) = \frac{dV_3}{\varphi} \quad \text{exist and satisfy} \quad \theta_1^2 + \theta_2^2$$

$+ \; \theta_3 = 1$ a.e. (φ). The vector $\theta(w) = (\theta_1, \theta_2, \theta_3)$ may be thought of as the direction normal to the surface (T,A) at T(w). Then if

$D = \{\theta_1, \theta_2, \theta_3): \theta_1^2 + \theta_2^2 + \theta_3^2 = 1\}$ and $f(x,y,z, \theta_1, \theta_2, \theta_3)$ is any

function which is Borel measurable and bounded on $T(A) \times D$, the integral

$$H(T,A,f) = (A) \int f(T(w), \theta(w)) \, d\varphi$$

exists and is the integral of f over (T,A).

Periodic Solutions of Nonlinear Differential Equations. W. R. FULLER, Purdue University.—The present paper is expository in nature. In it are indicated some types of nonlinear differential equations or systems of such equations, for which existence theorems for period solutions have been studied. This includes systems containing a small parameter, ε, which for $\varepsilon = 0$ have periodic solutions. In particular the study of systems of the form $x + \sigma^2 x = \varepsilon f(x,x,t;\varepsilon)$ where $\sigma^2 x$ and f are n-vectors has been very fruitfully attached by a method of L. Cesari which has been applied to a wide class of problems by Cesari, Hale, Gambill, Bailey and the author.

Localization Experiment for Teaching Geometry. A. D. HUMMEL, Ball State Teachers College.—The calculation of the distance between two points from their x, y, and z coordinates is well known. A method of determining these coordinates of points within a body by means of X-rays is reviewed. Projected images of scales are used as measuring sticks in two radiographs. The source of X-rays has different positions for the two radiographs. Elementary geometry is used to compute the coordinates of any point appearing in both radiographs. In the experiment described for teaching, a small source of visible light is substituted for the X-ray source. Data obtained from shadows is used to calculate the length of an object. Verification of the result by direct measurement should strengthen the student's faith in geometry.

Undergraduate Curricula—Some Brave Experiments and Cogent Lessons. ARNOLD E. ROSS, University of Notre Dame.—There are many, all too many critical problems which confront one in the task of implementing an effective undergraduate program in mathematics. Today such a program must not only appeal to the people who have traditionally relied upon mathematical tools, but it must also appeal to the users of new mathematics most of whom come from the humanities, from commerce, and from the "preprofessional" groups. The novelty of the new undergraduate curriculum lies not only in the new content but also

in the growing recognition that mathematical manipulative skills alone do not develop the capacity for intelligent application nor do these skills alone justify considering mathematics as one of the liberal arts.

To design a proper blending of the new and the old, of ideas and of skills, and to make this blend accessible to the very young brings us close to the fundamental questions in the art of communication. It is the purpose of this short talk to discuss and to illustrate some of these questions.

It should go without saying, but it will bear much repeating, that a knowledgeable, imaginative, and resourceful teacher is still the key to the success of any enlightened curriculum. This observation applies to the teaching of all mathematics, even the so called "very elementary mathematics". Thus it is vital that not only the teaching of the undergraduate should reflect faithfully a sound outlook on both teaching and mathematics, but that this should hold also for a Mathematics Teacher Training Program (such as we have undertaken at Notre Dame for example).

On the Inter-relationship of Applications and Mathematical Research. KAJ L. NIELSEN, U. S. Naval Avionics Facility, Indianapolis, Indiana.—There seems to be no limit to the application of mathematics to contemporary non-mathematical fields. To present a complete survey of the utilization of mathematical research in engineering, economics, production, sociology, psychology, medicine, etc., would be quite beyond the scope of this paper. We shall therefore limit this discussion to the inter-relationship of mathematical research with some technological developments, electronic calculating machines and the philosophy of education. The mathematician's role in industry; industry's utilization of mathematicians; the development of new mathematics and the need for closer unity between user, producers and educators of mathematical research is discussed from the author's point of view.