IOWA SECTION MAA



NEWSLETTER

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For the announcement of the joint meetings of the Iowa MAA and IMATYC on April 24 and 25, 1992, see page 3.

OLSON ELECTED AS NEW GOVERNOR

Marcia P. Sward, executive director of the MAA, reports that Professor Lynn Olson, Professor of Mathematics and Computer Science at Wartburg College, has been elected Governor of the Iowa Section of the MAA for the period July 1, 1992 - June 30, 1995. Congratulations!!

Lynn Olson earned his undergraduate degree from the University of Minnesota, Morris, where he majored in mathematics, minored in physics, and obtained secondary teaching certification. After teaching mathematics and physics at Goodhue, Minnesota, for two years, he attended Bowling Green State University where he completed the master's degree. He continued graduate work at Notre Dame University, writing a thesis in algebra (representation theory in finite groups). After graduation he taught at Cardinal Stritch College in Milwaukee for two years before taking a position in mathematics and computer science at Wartburg College. In mathematics his particular interests are in teaching geometry and discrete structures, while in computer science his main interest is graphics.

PRESIDENT ELECT NOMINATIONS

The nominating committee, consisting of Anita Solow (Chair), Elgin Johnston, and Donald Meyer, is pleased to nominate three people for the position of Chair-Elect of the Iowa Section of the MAA. They are Catherine A. Gorini (Maharashi International University), Reginald Laursen (Luther College), and Douglas A. Swan (Morningside College). Biographical sketches follow. **Catherine Gorini** is Associate Professor of Mathematics and Dean of the College of Arts and Sciences at Maharishi International University, where she has been on the faculty since 1978. Cathy did her undergraduate work at Cornell University, received her master's degree in mathematics from the University of Virginia in 1977, and completed her Ph.D. in 1982 under Robert Stong at the University of Virginia in algebraic topology. Current research interests are in geometry and tilings, and she is in the process of writing a textbook for MIU's general education geometry course. Activities at MIU include advising the MAA Student Chapter and MIU's teams for the Putnam Examination and the Mathematical Competition for Modeling.

Reginald Laursen is Professor of Mathematics at Luther College. Reginald earned his bachelor's degree at Pacific Lutheran College and the Ph. D. from Washington State University. His interests include the applications of mathematics to management science and the teaching of mathematics, particularly the use of computer technology to enhance instruction of the Calculus level. In the past he has given talks on teaching Calculus to this gathering and the NCTM Regional Conference, and will co-present a workshop entitled "Home-Grown Software for Calculus Instruction" at the Third Annual Conference on College Mathematics: Teaching, Technology, and Applications, held at Grand Rapids, Michigan, March 20-21, 1992. He was faculty advisor of the Luther College team for the Mathematical Contest in Modeling, 1992. He is currently a member of the AMS, MAA, and ICTM.

Douglas A. Swan earned his Ph.D. at the University of Vermont in 1974. His master's degree is from Michigan State University. He has been Chairman of Mathematical Sciences at Morningside College since 1983 and previously chaired departments at three other small colleges. In the past 5 years he has attended two national conferences on modernizing math instruction and presented four papers on teaching calculus and differential equations using computers, emphasizing writing, and this year on cooperative learning at the Iowa sectional meeting. Dr. Swan is also an officer of three local, state, and national civic organizations and his local church.

CALCULUS REFORM WORKSHOP

July 5—July 10

Iowa calculus instructors are invited to participate in a one week MAA/NSF-sponsored workshop on calculus reform. Workshop activities will include discussions of issues in calculus reform, innovative ideas for classroom activities, daily work with Mathematica on Next computers, and creation of classroom projects by teams of participants.

Materials, room (double accupancy), and board will be provided free of charge for all workshop participants. Applicants must be teachers at the high school, community college, four-year college, or university level, and should provide evidence that they will be involved with a calculus course during the following year.

The workshop will be held on the campus of The University of Wisconsin at La Crosse. Participants should plan to arrive in the afternoon of Sunday, July 5. The workshop will end at 1:00 Friday, July 10. For more information, or to apply for a place in the workshop, write or call Professors Elgin Johnston (515-294-7294) or Jerold Mathews (515-294-5865) at Department of Mathematics, Iowa State University, Ames, Iowa 50011 or Professor Keith Stroyan (319-335-0789), University of Iowa, Iowa City, Iowa 52242.

Welco

Program Highl the MAA and D colleagues. Ou will be giving Fink of Iowa S Please no demonstration -Elgin Johnston format. We Mathematica 2 Saturda those interese Learning in Cal Directions: of buildings. Housing: You a double roon at the Lamon breakfast abou Note: Please the same wee by Wednesda and phone nut Accomodation Walker (dorm

Chief Lamoni

Super 8 Motel

Hansen House

Eating: On can price (\$4.25 for may get salad, price (SC). Center (MSC). Chack, the Coffee have been listed in the salar price of the salar price

Added Attraction

held Saturday and Center, the restore

Dint Meetings of the Iowa MAA and IMATYC Graceland College, Lamoni, Iowa 7 and Saturday, April 24 and 25, 1992 Convention Information

ollege is proud to host the 1992 joint meetings of the Iowa section of 's program is full of special events and opportunities to meet with ker this year is Gerald Alexanderson of Santa Clara University. He *Mathematics*, and *q-Binomial Coefficients*. Also featured is A. M. se talk is, *Every Mathematician Loves an Inequality*.

Friday afternoon. *Calculus and Computing* is a 3 hour hands-on is in a calculus course. Keith Stroyan of the University of Iowa, and ersity will be presenting examples of their courses in a workshop tam, Inc. for special permission to make additional copies of

include both technical papers and pedagogical techniques. For he classroom, there is a 50 minute presentation *Cooperative* e system Derive.

vest on highway 69. See the campus map for parking and location

the Walker Conference Center (dorm room) for \$10.00 per person in a bedding, the cost is \$5.00). There are two motels in town, located ailes from campus. Hansen House, built in 1883, is a bed and ous.

ousing. Due to an Antique show and two large campus activities wed, even on campus. To reserve a dorm room, please write or call me, the number of males, and the number of females. The address

dithPhone 515-784-5283ment(Automatic transfer to Math office after 3 rings,llegeand an answering machine after 7 rings.)140

Reservations	Includes
515-784-5283	
515-784-3329	
515-784-7500	Breakfast
515-784-7749	Breakfast
	Reservations 515-784-5283 515-784-3329 515-784-7500 515-784-7749

the serving line at the Floyd M. McDowell Commons, for a single s a self-serve salad bar and ice cream machine. Alternatively, one gs, etc. a la carte from the Swarm Inn in the Memorial Student include the Quilt Country Family Restaurant, Pizza Hut, Pizza and Barth Dairy Cup. These are all on highway 69, and they west.

annual "Iowa Quilt City Antique and Collectable Show" is being and 26 outside the Lamoni high school gym. Liberty Hall Historic unith III, is open for tours on Saturday.



Joint Meetings of the Iowa MAA and IMATYC Graceland College, Lamoni, Iowa April 24 and 25, 1992

Friday, April 24	4, 1992	
Time 1:00 PM	Event Registration	Place Shaw Lobby
1:30 - 4:30 PM	MiniCourse: Calculus and Computing	101 Science
1:30 - 5:00 PM	Student Papers	167 Shaw
5:00 - 7:15 PM	Supper on your own	
7:15 - 8:00 PM	Gerald Alexanderson, Santa Clara University Music and Mathematics	167 Shaw
8:10 -10:00 PM	Informal Reception and Social Hour	Americas Rooms, MSC
Saturday, April Time 8:00 AM	l 25, 1992 Event Registration	Place Shaw Lobby
8:35 - 9:35 AM	Gerald Alexanderson, Santa Clara University q-Binomial Coefficients	167 Shaw
9:50 - 10:50 AM	A. M. Fink, ISU Every Mathematician Loves an Inequality	167 Shaw
11:00 - 11:30 AM	Business Meetings and Student Awards	167 Shaw
11:30 - 1:00 PM	Lunch	
11:45 - 1:00 PM	Lunch for MAA Student Chapter Advisors and POTENTIAL MAA Student Chapter Advisors	Commons West Side
11:45 - 1:00 PM	IMATYC Luncheon	Commons Gold Room
1:00 - 3:30 PM	Concurrent Sessions	102/103/146 Science

Friday Aft Time 11:30 - 1:55 2:30 - 2:25 3:30 - 3:25 3:30 - 3:25 3:30 - 4:25 4:30 - 4:25	ernoon Sessions (Student Papers) Roon Speaker Russell L. Chalfant, Drake Sally A. Shepard, Drake Ivica Kalicanin, MIU Jason Gohlke, NIACC Lawrence Pelo, Mason City HS/NIACC Sid Baccam, Drake Andrew Averill, MIU	 167 Shaw Title Unusual path graphs On the crossing number of selected graphs Error analysis in numerical integration Application of computer science to aid im the le Cryptanalysis Hypospectral graphs Idempotent endomorphisms in finite-dimension 	arning of the Japanese language nal v*-algebras
Saturday / Time 1:00 - 1:25	Afternoon Concurrent Sessions Room 102 Science Catherine A. Gorini, MIU Some new results about Penrose tilings	Room 103 Science Charles H. Jepsen, Grinnell A summer undergraduate research project in geometry	Room 146 Science Stephen J. Willson, ISU A less arbitrary social choice function
1:30 - 1:55	A. M. Fink, ISU Crinkled functions	Eric W. Hart, MIU The impact of the NCTM standards on collegiate mathematics	Joel K. Haack, UNI Audible group theory
2:00 - 2:25	Milan Randic', Drake Fitting of non-linear regressions by orthogonalized power series	Daniel Ashlock, ISU The Dave Barry technique for teaching math	Doug Swan and Steve Nimmo, Morningside Cooperative learning in calculus (2-session presentation)
2:30 - 2:55	Bernadette M. Baker Alexander F. Kleiner and Milan Randic', Drake Spectral properties of graphs and multigraphs	Lynn Olson and Glenn Fenneman, Wartburg Perspectives in mathematics: a non-standard course for seniors	Doug Swan and Steve Nimmo Cooperative learning in calculus (Continuation of previous session)
3:00 - 3:25	Alexander F. Kleiner and Milan Randic', Drake Terminal polynomials are not unique	Joseph J. Engler, Clinton Community College Chaos and fractals to teach discovery mathematics	Ronald K. Smith, Graceland Toward a more fair, efficient, and compassionate pinewood derby

Friday Student Papers Room 167 Shaw

UNUSUAL PATH GRAPHS Russell L. Chalfant Drake University

A path graph, P-graph briefly, is defined here as a graphical representation of paths emanating from a vertex. Nonequivalent vertices often produce different P-graphs. When two graphs generate an isomorphic P-graph we refer to such as unusual. Although isomorphic P-graphs are not commen we will illustrate many graphs that produce isomorphic P-graphs and will discuss some of the regularities found in such graphs, as well as their construction.

ON THE CROSSING NUMBER OF SELECTED GRAPHS Sally A. Shepard Drake University

The crossing number, χ , of a graph is the smallest possible number of crossings of lines (edges) when a graph, G, is represented pictorially. The problem of finding χ for a general graph is known to be difficult. We will consider several classes of graphs and will report on the crossing numbers determined. In particular, we will examine for special graphs possible relationships of χ and χ , the crossing numbers of G and its complement G, respectively.

ERROR ANALYSIS IN NUMERICAL INTEGRATION Ivica Kalicanin Maharishi International University

This paper is an analysis of analytic errors and computational (round-off) errors in a program ZAQDO (Zero Approximation of Quasi-Differential Operators) in which Simpson's method of numerical integration is applied. This program is written in Turbo C programming language for IBM compatible computers, with use of an 8086, 8087 processor's floating point arithmetic.

APPLICATION OF COMPUTER SCIENCE TO AID IN THE LEARNING OF THE JAPANESE LANGUAGE Jason Gohlke North Iowa Area Community College

In writing software to aid me in my Beginning Japanese class, I have applied what I have learned in my college career as a computer science major. I wish to demonstrate how the program was developed using the help of fellow students and instructors for input, what the program is designed to achieve, and how I have attempted to accomplish these objectives. This includes work with Japanese reading, writing, and sentence structure.

CRYPTANALYSIS Lawrence Pelo North Iowa Area Community College

We will discuss various techniques of encryption and decryption. The talk will focus on the use of discrete mathematics (i.e., number theory and matrices) and computer science.

HYPOSPECTRAL GRAPHS Sid Baccam

Drake University

We define a graph H as hypospectral if it is a subgraph of G with no zero coefficients in the eigenvectors having a common eigenvalue with G. We have searched for such graphs and will illustrate a few. We will discuss the underlying connectivity properties of hypospectral graphs.

IDEMPOTENT ENDOMORPHISMS IN FINITE-DIMENSIONAL v*-ALGEBRAS Andrew Averill Maharishi International University

A v*-algebra is a generalization of a vector space, sharing many of the properties related to independence, basis, and dimension, but with a more general algebraic structure. In this paper, the following theorem is proved: In an n-dimensional v*-algebra, the semigroup of singular endomorphisms is generated by the idempotent endomorphisms of rank n-1. This theorem extends earlier results showing that the semigroup of singular transformations of a finite set is generated by the idempotent transformations, and that the semigroup of linear transformations of a vector space is generated by the idempotent transformations.

Saturday Concurrent Sessions Room 102 Science

SOME NEW RESULTS ABOUT PENROSE TILINGS Catherine A. Gorini Maharishi International University

This paper will review some of the strange and well-known results about Penrose tilings and prove some new results. There is a point in some tiling whose neighborhoods look as much as one likes to any other neighborhood in any other tiling. Also, the ratios of vertex types and edge types in any Penrose tiling are all powers of the Golden Mean.

CRINKLED FUNCTIONS A. M. Fink Iowa State University

We generalize an old result of Banach, which says that if a function wiggles a lot, then the graph must intersect a horizontal line often. We replace 'a horizontal line' by the graph of a polynomial of degree n. Of course this requires a different definition of 'wiggles a lot'.

FITTING OF NON-LINEAR REGRESSIONS BY ORTHOGONALIZED POWER SERIES Milan Randic' Drake University

We outline a procedure which resolves ambiguities in fitting nonlinear data by power series. As is well known, the coefficients in the regression equations depend on the truncation of the power series. We outline the procedure in which the coefficients of the regression using a power expansion are independent of the degree of the polynomials used. This is achieved by considering mutual regression of descriptors and using residuals as novel variables. The derived regression equations show unusual numerical stability, i.e., the coefficients of the regression equations are constant and independent of the truncation of the power series.

SPECTRAL PROPERTIES OF GRAPHS AND MULTIGRAPHS

Bernadette M. Baker, Alexander F. Kleiner and Milan Randic' Drake University

We will review selected topics from graph theory involving their spectra and will particularly focus on graphs with common eigenvalues, graphs with integer eigenvalues, isospectral graphs and multigraphs. A number of pairs of graphs having multiple connectivity and showing the same eigenvalues will be discussed and used in the construction of novel graphs with similar properties.

TERMINAL POLYNOMIALS ARE NOT UNIQUE

Alexander F. Kleiner and Milan Randic' Drake University

If G is a tree, the terminal polynomial of G is defined to be the characteristic polynomial of the matrix whose elements are the distance between the terminal nodes of G. In this note we show that there exist distinct trees (with three terminal noodes) with the same terminal polynomial. The search for such trees is aided by a result due to E T Bell.

Saturday Concurrent Sessions Room 103 Science

A SUMMER UNDERGRADUATE RESEARCH PROJECT IN GEOMETRY Charles H. Jepsen Grinnell College

This talk will describe an undergraduate research experience planned for a small number of Grinnell College students this summer. The focus of the research will be problems in dissections and tilings, packings and coverings, geometrical configurations. Examples will be given of the types of problems the group will consider, including: what the general problem is, what is known, what is unknown, what (if anything) I have contributed to the problem.

The Impact of the NCTM Standards on Collegiate Mathematics Eric W. Hart Maharishi International University Fairfield, Iowa 52557-1052 An abstract submitted for the Iowa MAA Meeting, 1992

There is a crisis in mathematics education in this country today, as documented and discussed in many recent national reports. It is clear that a solution to the grave problems facing mathematics education must include three components: a worthwhile curriculum, effective teaching, and receptive students. The National Council of Teachers of Mathematics has proposed standards for a worthwhile curriculum (NCTM, 1989) and for effective teaching of mathematics (NCTM, 1991), which have been endorsed by the MAA, and which, if implemented, will go a long way towards improving school curricula and instruction. The missing link is a systematic program for directly promoting the personal development of students, in order to create receptive learners. Transcendental Meditation (TM), which is a proven technique for stress reduction and self development, can provide this missing link. Documented results of the regular practice of TM include increased intelligence, decreased stress, increased self-actualization, and increased creativity.

This talk will present a holistic approach to collegiate mathematics education. In particular, after a brief discussion of the educational benefits of TM, the direct relevance of the NCTM Standards to collegiate mathematics will be discussed. Several examples will be given.

THE DAVE BARRY TECHNIQUE FOR TEACHING MATH Daniel Ashlock Iowa State University

In this talk I will present a new slant on the problem of getting students to work problems at the board. I have had great success with the technique which involved substantial audience participation in both the problem working and setting the context in which the problems are to be worked. The technique was specifically developed for large (30-50) classes and works best in that setting. Those attending will be asked to help in a quantitative investigation of the technique to be presented next year at the Iowa Chapter Meeting.

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PERSPECTIVES IN MATHEMATICS: A NON-STANDARD COURSE FOR SENIORS Lynn Olson and Glenn Fenneman Wartburg College

The general education requirements at Wartburg require that each major include a capstone course which synthesizes learning in that field. Our departmental capstone course is not taught in the traditional manner. Students read selections from the philosophy and history of mathematics along with several selections dealing with current issues involving mathematics in society. The class revolves around bi-weekly group discussions but there is also a significant writing component. The benefits and pitfalls of such a course will be presented.

CHAOS AND FRACTALS TO TEACH DISCOVERY MATHEMATICS Joseph J. Engler Clinton Community College

Students should be enticed to learn on their own. They should be encouraged to discover all the concepts that they encounter. When a student is in a mathematics class he should be encouraged to learn the concepts on his own. Lecture time should be merely to strengthen the discovery learning of that student. This is what I would call the ideal learning situation, but it is not always possible. The varying levels of the students in a mathematics course make it increasingly difficult to approach the discovery method of learning. One way instructors can approach such a level of learning is to introduce the beauty of chaos and fractals to the student and have him discover the mathematics. This will trigger a domino effect. The student learns the mathematics of fractals on his own and gains a feeling of satisfaction. Not wanting to loose this feeling of satisfaction the student uses the discovery method on his normal assignments and learning by discovery is implemented.

Saturday Concurrent Sessions Room 146 Science

A LESS ARBITRARY SOCIAL CHOICE FUNCTION Stephen J. Willson Iowa State University

Each voter is assumed to have a ranking of n candidates, with ties permitted. The objective is to produce a ranking among the candidates for the collection of voters as a whole. Some familiar methods are reviewed, such as the Borda vote or the Condorcet vote. A new method is proposed in which the candidates are ranked according to the mean limiting absolute probabilities of a related Markov chain.

AUDIBLE GROUP THEORY Joel K. Haack University of Northern Iowa

Steve Reich's musical composition, "Clapping Music," provides an opportunity to hear such group theoretic concepts as cyclic permutations. Variations on his theme can "illustrate" the order of the product of disjoint cycles.

COOPERATIVE LEARNING IN CALCULUS Doug Swan and Steve Nimmo Morningside College

Our presentation will be based on using cooperative learning in conjunction with Derive in the teaching of Calculus I and II. We have been team teaching the Calculus sequence this past year based on an approach developed at Purdue University by Ed Dubinsky and Keith Schwingendorf. In our presentation, we will disucss why we went with this approach. Major factors were: 1) It promotes active learning instead of passive learning. 2) It creates natural support groups. 3) It models the problem solving approach of industry. We will also discuss how groups are formed, a typical class day (both with the computers and without), team and individual aspects of the course, and how we grade.

TOWARD A MORE FAIR, EFFICIENT, AND COMPASSIONATE PINEWOOD DERBY Ronald K. Smith Graceland College

Each year Cub Scouts from all over mount car bodies, made of pine, on plastic wheels and roll them down wooden tracks in the race known as the Pinewood Derby. A schedule for the races is standard if (i) each car races in each lane exactly once. It is fair if (ii) no pair of cars races against each other more than once. It is efficient if (iii) no car runs in two consecutive races. Finally, a schedule is compassionate if a car can be added to the it after the races start without violating the first three conditions.