IOWA SECTION MAA

NEWSLETTER
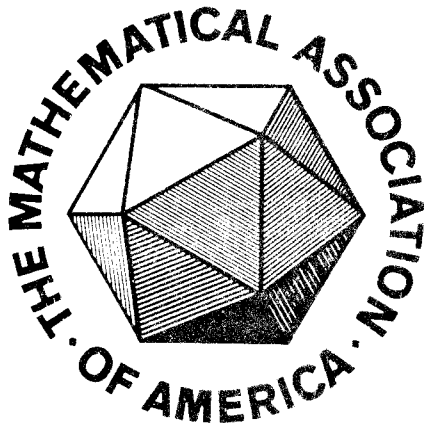
GOVERNOR'S REPORT
LYNN OLSON

The Board of Governors met in San Antonio on January 12th. This was Deborah Tepper Haimo's last meeting as President. Don Kreider, who recently chaired the MAA-AMS Cooperation Committee, is the new President.

Again the publication sales seem to be very good. Over 1000 of the videos have been sold with almost 200 of these being the Polya video on guessing. Even though there were several new books this year, several more are scheduled for this next year with at least two ready by summer. MATH HORIZONS, MAA's new magazine for students will begin publication in 1993. Through grants it will be free the first year but indications are that the MAA will then ask departments to contribute $2 per student. I would also like to note that one of the highlights of this meeting was the celebration of the Centennial of the MATH MONTHLY.

Andrew Sterrett, Assistant Director of Programs, is coordinating a series of "Mathematicians of the Month" which have been sent to student chapters. He feels this is an excellent way to publicize your institution and he welcomes information about particular graduates who have interesting occupations.

The MAA STRATEGIC PLAN was approved. The proposed mission statement reads "To advance the mathematical sciences, especially at the collegiate level". With this mission there are four major program goals in the areas of Education, Professional Development, Students and Public Policy. In addition to program goals there are operational goals for Sections, Publications, Governance, Membership and Finance. The program goal in the area of Education had generated considerable debate at the summer meeting. The approved goal now is: "Stimulate active learning, promote effective teaching, and encourage appropriate assessment in the mathematical sciences". Unbelievably there was no debate this time. At the spring meeting at Luther College, I will give you details about how the Plan will be distributed to the membership.

In addition, a new document entitled "Guidelines for Programs and Departments in Undergraduate Mathematical Sciences" was approved. This was the result of a three year study with several reviews and revisions. The intent is that it will be used by departments in self studies, planning, and assessment. As with the Strategic Plan, I will either distribute it or give information on its publication.

One further highlight of the meeting in San Antonio was the inauguration of the first national awardees for teaching. Bob Hogg was one of the four honored. In his short speech he was in "fine" form as usual. I certainly enjoyed his remarks and was proud of our choice as an outstanding educator in the section.

The next meeting of the MAA is in Vancouver, British Columbia during August 15-19, 1993. It will be held jointly with the AMS and the Canadian Mathematical Society. In addition to being a strong mathematical conference there will be many of the friendly sociological aspects of the summer MathFests. Incidentally, the next MathFest is scheduled August 15-17, 1994 at the U of M in Minneapolis. As reported in the current FOCUS, the MAA and the AMS decided not to hold its winter 95 meeting in Denver. This decision came after much discussion in a joint meeting of the AMS and MAA board.

NOMINATIONS FOR PRESIDENT ELECT AND SECRETARY-TREASURER

The nominating committee for the 1993 Iowa Section of the MAA elections hereby nominates the following candidates.

Chair Elect:
        Emily Moore, Grinnell College
        Richard Tondra, Iowa State University

Secretary-Treasurer:
        David Streid, Maharishi International University
        Steven Nimmo, Morningside College

We have obtained the following biographical data on the nominees.

David Streid has been an Assistant Professor of Mathematics at Maharishi International University since 1989. He graduated from MIU in 1980 and completed his Ph.D. at the University of Illinois in 1990. His interests are in complexity theory, the calculus reform movement, and technology in the classroom.

Richard Tondra has been a Professor of Mathematics at Iowa State University since 1979. He graduated from the University of Notre Dame in 1965 and received his Ph.D. from Michigan State University. His current interests are in low-dimensional manifold theory, geometry, the calculus reform movement, and the Master of School Mathematics degree program.

Steven Nimmo is an Associate Professor of Mathematics at Morningside College and has been teaching there since 1988. A graduate of Monmouth College, Nimmo earned the Ph.D. degree at Iowa State University in 1988, writing a thesis in the area of non-associative algebras. His areas of interest include cooperative learning in the teaching of calculus and other mathematics courses.

Editor's Note: The nominating committee consisted of E. James Peake (Iowa State University), Catherine Gorini (Maharishi International University), and George Trytten (Luther College). We thank them for serving on the nominations committee. Also, Professor Moore's biographical sketch is missing because it had not arrived at the time the newsletter went to press. My apologies.

Joint meetings of the Iowa MAA and IMATYC

April 16-17, 1993, Luther College, Decorah, Iowa

Friday, April 16, 1993

Time	Event	Place
12:40PM	Registration	CFL (Center,Faith & Life)
** 1:30-3:30PM	Concurrent Student Paper Sessions	Valders 212,206
3:40-6:00PM	Student Modeling Competition	Valders 264
3:40-5:40PM	SUMMA workshop	Valders 206
3:40-4:40PM	State of Technology in the Iowa Section	CFL Recital Hall
4:50-5:55PM	Classroom Group Activities and Projects	CFL Recital Hall
5:55-8:00PM	Supper on your own (1992 Lacrosse Workshop Participants Eat and Discuss Together)	
8:00-8:50PM	Keith Devlin: *Alan Turing and the Childlike Simplicity of Mathematical Genius*	CFL Recital Hall
9:00-10:15PM	Informal Reception and Social Hour	Farwell Hall Lounge
9:30-10:30PM	Student Pizza Party	Brunsdale Lounge

Saturday, April 17, 1993

Time	Event	Place
8:00AM	Registration	Valders Concourse
8:35-9:35AM	Keith Devlin: *Mathematicians, Sociologists and Photocopy Machines*	Valders 117
9:45-10:30AM	George Trytten: *The Hungarian Connection: Von Neumann, Game theory & The Arms Race*	Valders 117
10:40-11:00AM	Governor Olson: Guidelines for Programs and Departments in Undergraduate Mathematical Sciences	Valders 117
11:00-11:30AM	Business Meetings	Valders 117
11:30-11:40AM	Student Awards	Valders 117
11:50-1:00PM	Lunch (IMATYC Luncheon, North side)	Peace Dining Room, Union
** 1:00-3:30PM	Concurrent Sessions	Valders 205/206/212

** See program changes on supplemental sheet – see page 6.

Friday Concurrent Sessions

Time	Valders 206	Valders 212
1:30-1:50	Carla Wafel, Drake U *Nodal Properties of Hexagonal Animals*	Amir Sehic, MIU *Applications of Ignorance:* *NP Problems and Cryptography*
1:55-2:15	Angie Myres, Buena Vista C *The Pebbling Number of a Graph*	Dennis Renner, NIACC *Climate Classification Program*
2:20-2:40	Kendall R. Bailey, Drake U *Potentially Stable Tree Sign Patterns* *with Five Vertices*	Enwei Xie, Luther C *Cyclic Reduction for Tridiagonal Systems* *on the Cray Y/MP*
2:45-3:05	Jiang Wu, Coe C *Integers Which are Multiples of* *Their Reversals*	David Knauff, Drake U *A Paradoxical Example in Weighted* *Voted Analysis*
3:10-3:30	Jeffrey Ortman, Luther C *Counting the Occurrences of Each Residue* *in Pascal's Triangle Modulo 8*	Ivica Kalicanin, MIU *A Charged Pendulum in an Electrostatic* *Field*

Saturday Concurrent Sessions

Time	Valders 205	Valders 206	Valders 212
1:00-1:25	Milan Randic, Drake *Matrices Associated* *with Graphs*	Catherine Gorini, MIU *Teaching the Beauty of* *Mathematics*	Ronald Smith, Graceland C *Toward a more Fair, Efficient,* *Compassionate Pinewood Derby*
1:30-1:55	Maura B. Mast, UNI *Closed Geodesics on* *on 2-Step Nilmanifolds*	Cal Van Niewaal, Coe C *Teaching Calculus as a* *Freshman Seminar*	Alexander F. Kleiner, Drake U *Constitutional Power in* *State Government*
2:00-2:25	Grant Izmirlian, Drake U *Exponential Changes of* *Measure and Large* *Deviations*	David Streid, MIU *Teaching Concepts First* *with the Harvard* *Consortium Calculus*	Preston J. Bush, U Dubuque *Harmony in Musical Scales:* *Mathematical Analysis and* *Keyboard Demonstration*
2:30-2:55	H. K. Krishnapriyan, Drake *The Vascillating* *Mathematician and Linear* *Difference Equations*	Joyce Becker, Luther C *Calculus from a Graphical* *Point of View*	Charles H. Jepsen, Grinnell C *New Results on a* *Dissection Problem*
3:00-3:25			David L. Craft, Buena Vista C *A Picture-Proof of the* *Euler-Poincare Formula*

Program Additions and Changes

The following paper abstracts came in after the deadline so please add and note the changes.

Friday

* 12:40PM   Registration   CFL

* 1:05PM   Student Paper: Jenette Tillotson, ISU   Valders 208
A Very Small Superpermutation

* 1:05PM   Student Paper: Giovanni Santostasi, MIU   ?
Rotations and Projective Space

Saturday

* 3:00-3:25   <u>Valders 205</u>   <u>Valders 206</u>
Michael H. Millar, UNI   Dan Danwell, ISU
What to do about Archimedes   *Artificial Life and Math Education*

Abstracts:

A Very Small Superpermutation
Jennette Tillotson, Iowa Stae University

A Superpermutation is a string S of characters on an alphabet A so that every member of the group of permutations of A in one line notation is a substring of S. In this talk I will present a construction for a very short superpermutation. This permutation has already been used to test (and break) algorithms that aid in the searching of DNA databases.

What to Do About Archimedes
Michael H. Millar, University of Northern Iowa

Given the range and depth of his works, the problem of selecting a small but still representative sample of Archimedes' works for consideration in a history-of-mathematics course can be a difficult one. The paper will focus on some of the author's successes (and failures) in this regard. We will look in particular at several examples from Archimedes' writings in which both his "Method", and his subsequent use of the method of exhaustion, can be put to good use in reaching a deeper understanding and appreciation of Archimedes as one of the very early progenitors of the calculus.

Artificial Life and Math Education
Dan Danwell, Iowa State University

The new field of artificial life has touched mathematics primarily in the area of functional and combinatorial optimization. The Alife technique of genetic algorithms is one that can be taught to computer literate freshmen and yields results on difficult problems relatively soon. In this talk I will show applications to calculus max/min problems and to graph coloring problems.

Rotations and Projective Space
Giovanni Santostasi, MIU

This paper investigates the relationships between the rotation groups SO(n) and real projective spaces RPn.

Joint Meeting Information

Program Highlights: We are very fortunate to have **Keith Devlin** of Colby College in Maine as this year's featured speaker. He is currently editor of the "Computers and Mathematics" section of the AMS Notices and the editor of FOCUS, the MAA Newsletter. Also featured is **George Trytten** of Luther College who will give us a bit of mathematical history.

The program format this year was designed to have no other activities conflicting with student paper sessions. The **modeling competition** is envisioned as a starter activity for students. We hope they will have fun with the interaction and, by attending, will be inspired to do their own paper. (Volunteers to grade solutions, while munching Subways, 6-8PM Friday are most welcome.)

The Friday afternoon sessions for faculty are designed so that we can be more help to each other. The **Technology Session** should have each representative from participating schools bring an outline of the different technologies tried and how they are being utilized, be it for classroom demonstration, every day in class activity, out of class labs, special projects, etc. The explanation should be very brief so that we can get through each school in the limited time allotted. It should serve as a catalyst for discussion for the rest of the meeting and beyond. We can learn from each others experiences. The **Group Activities Session** will be led by Reginald Laursen and Ronald Smith and will have two or three experiential activities for participants, as well as reports of class experimentation. It will end with an open discussion.

Florence Fasanelli, Director of the MAA Strengthening Underrepresented Minority Mathematics Achievement (**SUMMA**) project will give a two-hour **workshop**. Participants will work with materials developed by SUMMA to assist mathematicians in establishing middle school and high school intervention projects for minority students. Methods for proposal development, funding sources, and the art of proposal writing will be discussed. In addition, grant application forms and related documents will be available from various government agencies. The workshop will also provide information on teacher enhancement projects. Florence was previously a Program Officer at the National Science Foundation in the Science and Engineering Directorate.

The MAA Ad Hoc Committee on Guidelines has just produced a draft entitled "**Guidelines for Programs and Departments in Undergraduate Mathematical Sciences**" which was endorsed by the Board of Governors in January. On Saturday, Lynn Olson will lead a discussion on these guidelines prefacing his governors report.

Iowa participants of the **NSF UW-Lacrosse Summer 1992 Calculus Reform Workshop** will meet Friday evening for supper and discussion. Call Elgin Johnston (515-294-7294) or Jerold Mathews (515-294-5865) for more information.

There should be at least three book vendors at the meeting.

Directions: See the maps for Motel and College locations. There are too many cars on the Luther campus. I have highlighted the two best places to park. If you park below Farwell Hall, use the elevators in the hall to express to the top to get to upper campus.

Eating: You can go through the serving lines in the Student Union, or there is a coffee shop (Oneota). Off campus there is Cafe Deluxe, Cho Sun Chinese, Cliff House, Clarksville Diner, Country Kitchen, Hardee's, MacDonald's, Mabe's, Pizza Hut, Pizza Ranch, Ruby's, Stone Hearth Inn, and Subway. The Saturday luncheon will be in the Peace Dining Room of the Union.

Accommodations	Cost	Reservations
Cliff House Motel	$27.95+tax/one double bed, on up	319-382-4241
	$37.95+tax/double, on up	800-632-5980
Super 8 Motel	$30.48+tax/single	319-382-8771
	$37.69+tax/double, on up	800-848-8888
Heartland Inn	$35.00+tax/single	319-382-2269
	$42.00+tax/double, on up	800-334-3277
Midtown Motel	$18.00+tax/single	319-382-3626
	$26.00+tax/double, on up	

There is no housing available on campus.

Luther College:

Luther College was founded in 1861 by Norwegian immigrants and is a college of the Evangelical Lutheran Church in America. A Phi Beta Kappa institution, Luther is a selective liberal arts college.

The college offers more than 60 majors, pre-professional and certificate programs leading to the bachelor of arts degree. Seventy-three percent of Luther's 200 faculty hold an earned doctorate or terminal degree. Thirty-six states and 38 foreign countries are represented in the 2,350 member student body.

Co-curricular activities include 19 intercollegiate sports for men and women. Luther College has graduated more NCAA Postgraduate Scholarship winners than any other small college in the nation. Luther provides 10 music ensembles. More than 675 Luther students participate daily in music organizations. There is an active student congregation and daily chapel program. The college's strong academic program includes internships, professional semesters, and extensive study abroad opportunities.

Luther's scenic campus, with the Upper Iowa River running adjacent to a portion of its 800 acres, rivals any in the region. A new residence hall and a sports and recreation center addition to the Field House were completed in Spring 1991.

Further Input: Contact Reginald Laursen, Luther College, Decorah, IA 52101
        319-387-1171   e-mail: laursen@luther.uni.edu

Friday Student Contributed Paper Session

Potentially Stable Tree Sign Patterns with Five Vertices
Kendall R Bailey, Drake University

The problem of characterizing potentially stable sign-pattern matrices remains unsolved. This presentation is about potential stability of sign pattern matrices whose undirected graphs are trees(tsp's). Potentially stable tree sign patterns have been enumerated, up to size four. Our goal is to enumerate and characterize those with five vertices. Our main tool will be a computer program capable of generating all possible tsp's and corresponding matrix representations.

A charged Pendulum in an Electrostatic Field
Ivica Kalicanin, Maharishi International University

This paper attempts to describe the motion of a charged pendulum in the electrostatic field of a dipole.

A Paradoxical Example in Weighted Voted Analysis
David Knauff, Drake University

Brams provided an example of a weighted voting game in which an increase in the number of players produces an increase in the power, as measured by the Banzhaf Index, of one of the players. In this paper we investigate the application of the Banzhaf Index to a class of weighted voting games which generalizes Brams' example.

The Pebbling Number of a Graph
Angie Myres, Buena Vista College

Pebbling numbers is a recent topic of interest in graph theory. The definition and the computation of pebbling numbers will be discussed. These computations will be applied to graphs such as paths and cycles.

Counting the Occurrences of Each Residue in Pascal's Triangle Modulo 8
W. Jeffrey Ortman, Luther College

I will present a recursive formula that can be used to determine the number of occurrences of each residue in an arbitrary row of Pascal's triangle modulo 8. There exist corresponding closed form equations for Pascal's triangle modulo 2 and 4 that depend solely on the base 2 representation of a row n. Pascal's triangle modulo 8, however, is considerably more complex. I will make use of the repetitive structure of Pascal's triangle to develop an alternative method for determining the number of residues modulo 8. This method can be extended to solve the same problem for Pascal's triangle modulo p^2 or p^3 where p is any prime. The recursion is $O(B(n))$ where $B(n)$ is the number of ones in the base two representation of row n. The worst case is $O(\log(n))$.

Climate Classification Program
Dennis Renner, North Iowa Area Community College

I have developed this program to be used as an aid in classifying climate types for a geography instructor. I will talk about the flow of the program as well as the incorporated interface.

Applications of Ignorance: NP Problems and Cryptography
Amir Sehic, Maharishi International University

Everyone needs privacy, but not until the development of public-key cryptosystems could everyone afford it. This paper discusses the background of public-key cryptosystems (complexity theory, NP problems, and one-way trapdoor functions) and their applications (digital signatures, zero knowledge proofs, etc.). Examples include a system based on the knapsack problem, RSA, and DSA.

Nodal Properties of Hexagonal Animals
Carla Wafel, Drake University

We will introduce hexagonal animals (graphs derived by fusion of regular hexagons) and will consider enumeration of the Kekule structures in such. (The Kekule valence structures are alternatively known in the mathematical literature as perfect matchings). We follow the method first time outlined by J. R. Platt which is based on some properties of the eigenvectors associated with zero eigenvalue. In this procedure one partition vertices into zero and non-zero sets which are placed at alternating sites of a bipartite graphs and one tries to satisfy the zero-sum rule for each zero vertex in the graph considered. To find K, the number of Kekule valence structures, the approach may require introduction of variables x, y, to be subsequently determined. We will illustrate families of hexagonal animals classified according to x, y parameters.

Cyclic Reduction for Tridiagonal Systems on the Cray Y/MP
Enwei Xie, Luther College

The Finite Analytic (FA) method is used to solve the Navier-Stokes and heat equations for two dimensional fluid flow and heat transfer problems. As with other numerical solution methods, the FA algorithm transforms the governing partial differential equations to locally linearized algebraic equation approximations. If the resulting linearized problem is solved in an iterative fashion, a tridiagonal system of equations results. The Cyclic Reduction Method (CRM) is used to loosen the tridiagonal solution bottleneck in the FORTRAN code. By using vectorization utility on the CRAY Y/MP the partial vectorization offered by the CRM results in a factor of 2 speedup over the Thomas algorithm for sufficiently large systems.

Integers Which are Multiples of Their Reversals
Jiang Wu, Coe College

Can we find an integer which is an integral multiple of its reversal? For example, 9801 = 9*1089, is one of these interesting numbers. Martin Beech ('Mathematical Gazette, March 1990, p. 50), with the help of a computer, conjectured that all the numbers which are integral multiples of their reversals are in the form 8712, 87912, 879...912 or 9801, 98901, 989...901. This paper intends to provide a rigorous proof of this conjecture, and also use it as an example that computer conjecture can sometimes be incomplete.

Saturday Contributed Paper Session

Calculus from a Graphical Point of View
Joyce Becker, Luther College

This session will describe teaching from the St. Olaf calculus reform materials pilot text "Calculus from Graphical, Numerical, and Symbolic Points of View". Numerous illustrations and sample problems will be shared.

Harmony in Musical Scales: Mathematical Analysis & Keyboard Demonstration
Preston J. Bush, University of Dubuque

The harmony in various musical scales is compared by obtaining a harmonic sum for each scale. The sum is over the intervals possible in the given scale, using a measure for the harmony of an interval based upon how often the two tones of the interval are in phase. For scales of n tones, the goal is to find the scale that maximizes the harmonic sum. Graph theory is employed to find such scales for several values of n. Several interesting non-Western scales are demonstrated on the keyboard.

A Picture-Proof of the Euler-Poincare Formula
David L. Craft, Buena Vista College

We present a very visual proof of the famous formula which relates the order, size, region number, and genus for a two-cell imbedding of a graph in an orientable surface.

Teaching the Beauty of Mathematics
Catherine A. Gorini, Maharishi International University

How can we impart to students an appreciation for the abstract beauty of mathematics? This paper will present several examples used in introductory courses.

Exponential Changes of Measure and Large Deviations
Grant Izmirlian, Drake University

The technique of exponential change of measure is used in the proofs of Large deviations theorems. These are a class of results which establish the rate of exponential decay of the empirical mean as sample size increases. Basically we want to know the exponential rate of decay of $P \{ S\_n / n$ in $A \}$ where the closure of A does not contain the mean. This represents an "error probability". The exponential change of measure is used to convert this to a problem involving a process with mean inside the set A times the proper reweighting, whereby we may deduce the exponential decay rate. I will discuss the i.i.d. case and the Markov case and show how this can be used in the speedup of monte carlo simulation.

New Results on a Dissection Problem
Charles H. Jepsen, Grinnell College

Suppose we wish to dissect a square into pieces that are 1:2 rectangles of different sizes. What numbers of pieces are possible? We describe recent results obtained by computer search with the assistance of faculty colleagues and student summer researchers.

Constitutional Power in State Government

Alexander F Kleiner and David Knauff, Drake University

It is well known that the classical measures of power in weighted voting bodies, the Shapley-Shubik and Banzhaf Indices, sometimes give contradictory results. Straffin provided a generalization of these measures which resolves these contradictions by taking into account information about the mode of behavior of the players. In this paper we apply Straffin's ideas to the basic constitutional arrangement of an executive branch and a one or two house legislative branch. A set of formulae for computing power in these "state games" will be presented as well as applications to some specific states and issues.

The Vascillating Mathematician and Linear Difference Equations

H. K. Krishnapriyan, Drake University

Placing a problem in the setting of the "right" theory provides insight into the problem while illustrating the theory. We illustrate this by looking at a problem that appeared in the problem column of a popular journal.

Closed Geodesics on 2-Step Nilmanifolds

Maura B. Mast, University of Northern Iowa

The behavior of unit speed geodesics in a 2-step nilpotent Lie group can be understood by examining certain algebraic properties of the associated Lie algebra. Let N be a simply connected, 2-step nilpotent Lie group with Lie algebra N. Endow N with a left invariant metric $\langle , \rangle$. Write $N = V \oplus Z$, where Z is the center of N and V is the orthogonal complement of Z. For each $Z \in Z$, define a skew-symmetric linear transformation $j(Z) : V \to V$ by $\langle j(Z)X,Y \rangle = \langle [X,Y],Z \rangle$. for all $X,Y \in V$. We say that $j(Z)$ is in resonance if every ratio of non-zero eigenvalues of $j(Z)$ is rational. The Lie algebra N is called nonsingular if $j(Z)$ is nonsingular for all non-zero $Z \in Z$. In the case of nonsingular N with center of arbitrary dimension, we prove that $j(Z)$ in resonance for all non-zero $Z \in Z$ implies that the vectors tangent to smoothly closed unit speed geodesics in $\Gamma \backslash N$ are dense in $S(\Gamma \backslash N)$, the unit tangent bundle, for any lattice Γ in N. We obtain a partial converse, as well as a useful method for constructing examples in the 6-dimensional case.

Matrices Associated with Graphs

Milan Randic, Drake University

We will review matrices associated with graphs and their properties starting with the well known adjacency A and the distance matrix D. In addition we will introduce several novel matrices of graphs including vicinal matrix V, the Wiener matrix W, and the Rational matrix R. The vicinal matrix was introduced initially by Tratch, Stankevich and Zefirov and is based on enumeration of paths in a graph containing a path i,j. The Wiener matrix is defined only for trees by generalizing the procedure for calculation of the Wiener number defined for edges to the corresponding quantities defined for paths. The rational matrix is defined for graph embedded on a regular lattice such as honeycomb (a 2-dimensional regular hexagonal lattice) or diamond grid in 3-dimensional space. Some interesting properties of these matrices will be discussed.

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 (iv) a car can be added to the schedule after the races start without violating the first three conditions.

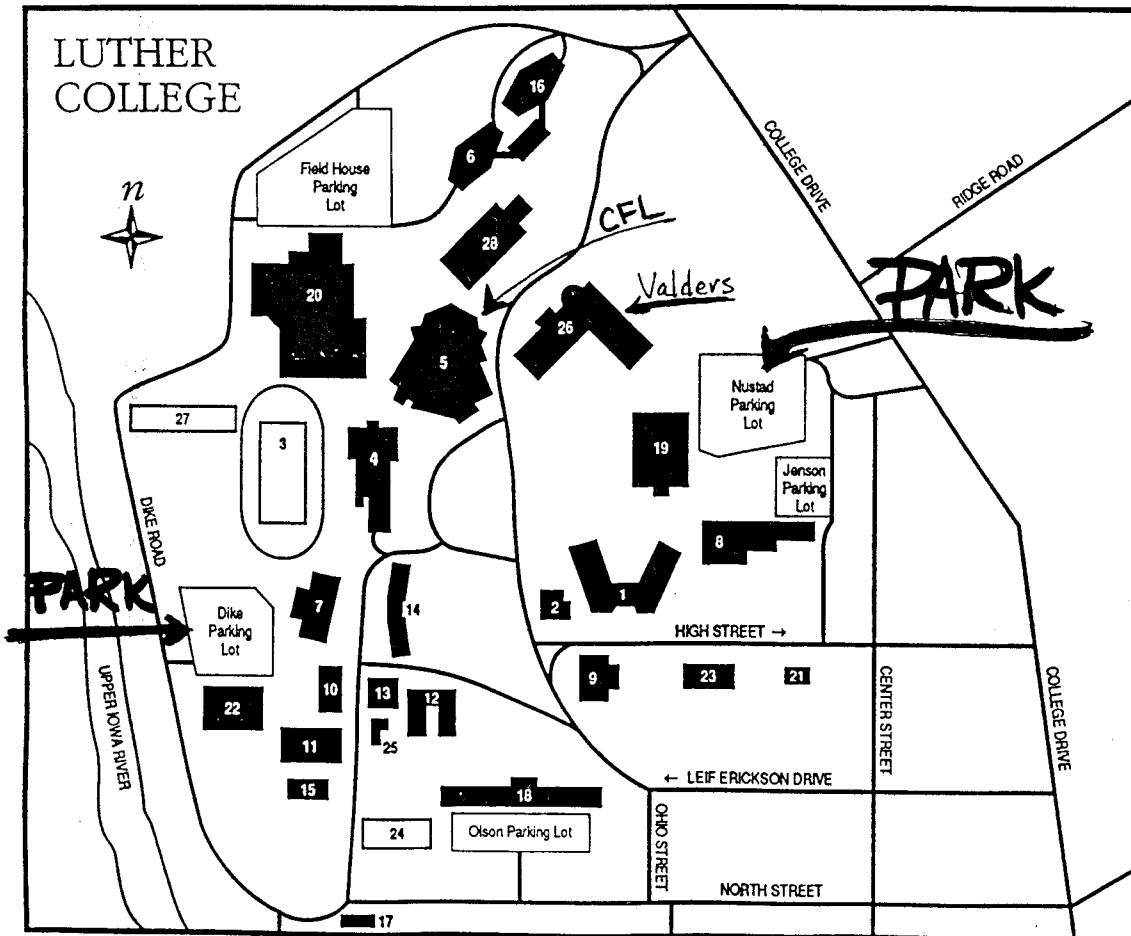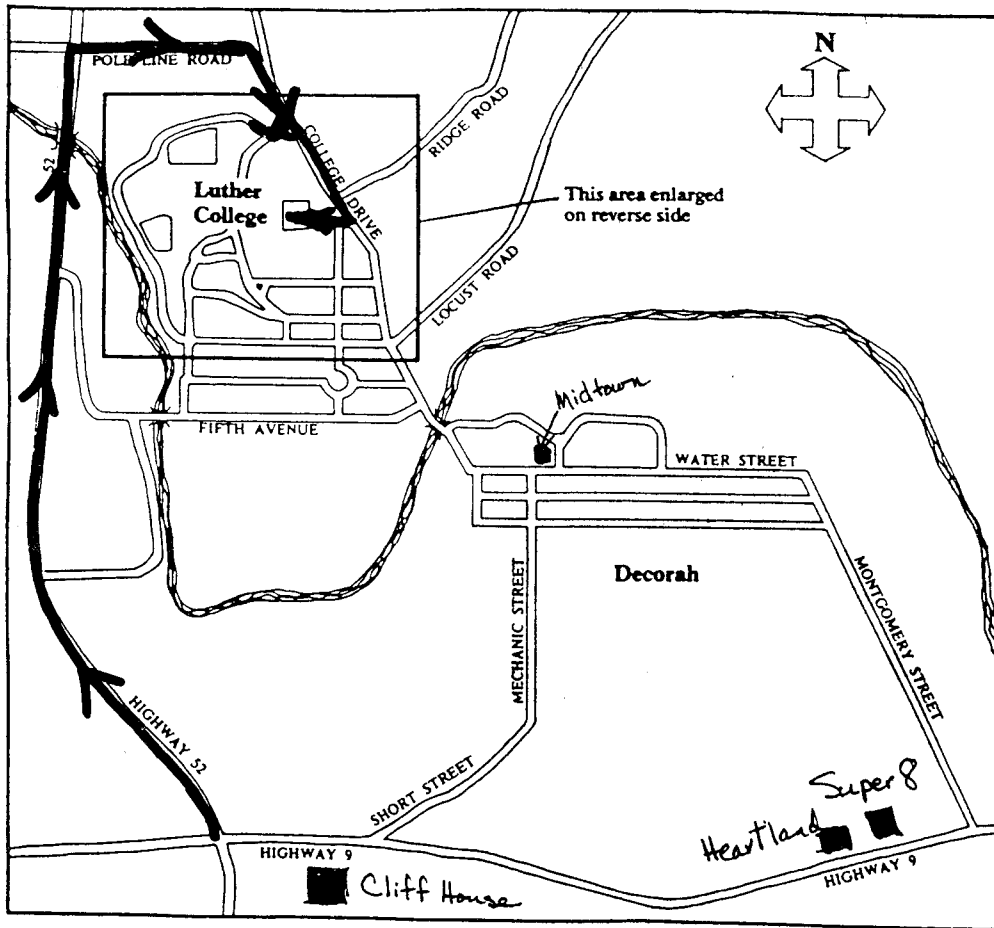## Teaching Concepts First with the Harvard Consortium Calculus

David Streid, Maharishi International University

One of the goals of the calculus reform movement is to deepen students' understanding of fundamental concepts of calculus. We will discuss how MIU has implemented the Harvard Consortium's text and how this has affected our students' thought processes while doing mathematics and their conceptual understanding of calculus.

Teaching Calculus as a Freshman Seminar

Cal Van Niewaal, Coe College

To replace the traditional common syllabus core course, Coe College adopted a Freshman Seminar program in 1992. Students are required to enroll in one special "seminar" section during the fall term. The seminars are writing intensive and include shared liberal arts activities. The Department of Mathematics and Computer Science decided to offer a special section of Calculus I as a Freshman Seminar. I will share my experiences in teaching this course for the first time last fall. While certain features of the course are unique to the Freshman Seminar concept, some ideas are adaptable for use at other institutions.

Map showing route to Luther College with handwritten annotations: Midtown, Super 8, Heartland, Cliff House. Roads labeled: POLELINE ROAD, RIDGE ROAD, COLLEGE DRIVE, LOCUST ROAD, FIFTH AVENUE, WATER STREET, MONTGOMERY STREET, MECHANIC STREET, HIGHWAY 52, SHORT STREET, HIGHWAY 9. Areas labeled Luther College and Decorah. "This area enlarged on reverse side"

LUTHER COLLEGE

Handwritten annotations: CFL, Valders, PARK (three locations)

Buildings and locations labeled on map: Field House Parking Lot, Dike Parking Lot, Nustad Parking Lot, Jenson Parking Lot, Olson Parking Lot, numbered buildings 1–28. Roads: COLLEGE DRIVE, RIDGE ROAD, DIKE ROAD, HIGH STREET, LEIF ERICKSON DRIVE, CENTER STREET, OHIO STREET, NORTH STREET, UPPER IOWA RIVER.

1. Brandt Hall
2. Campus House
3. Carlson Stadium
4. Centennial Union
5. Center for Faith and Life
6. Dieseth Hall
7. Farwell Hall
8. Jenson Hall of Music
9. Koren
10. Korsrud Annex
11. Korsrud Heating Plant
12. Larsen Hall
13. Loyalty Hall
14. Main
15. Maintenance
16. Miller Hall
17. Norby House
18. Olson Hall
19. Preus Library
20. Regents Center
21. Sperati Guest House
22. Storre Theatre
23. Sunnyside
24. Tennis Courts
25. TOHS
26. Valders Hall of Science
27. Wulfsberg Tennis Courts
28. Ylvisaker Hall

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