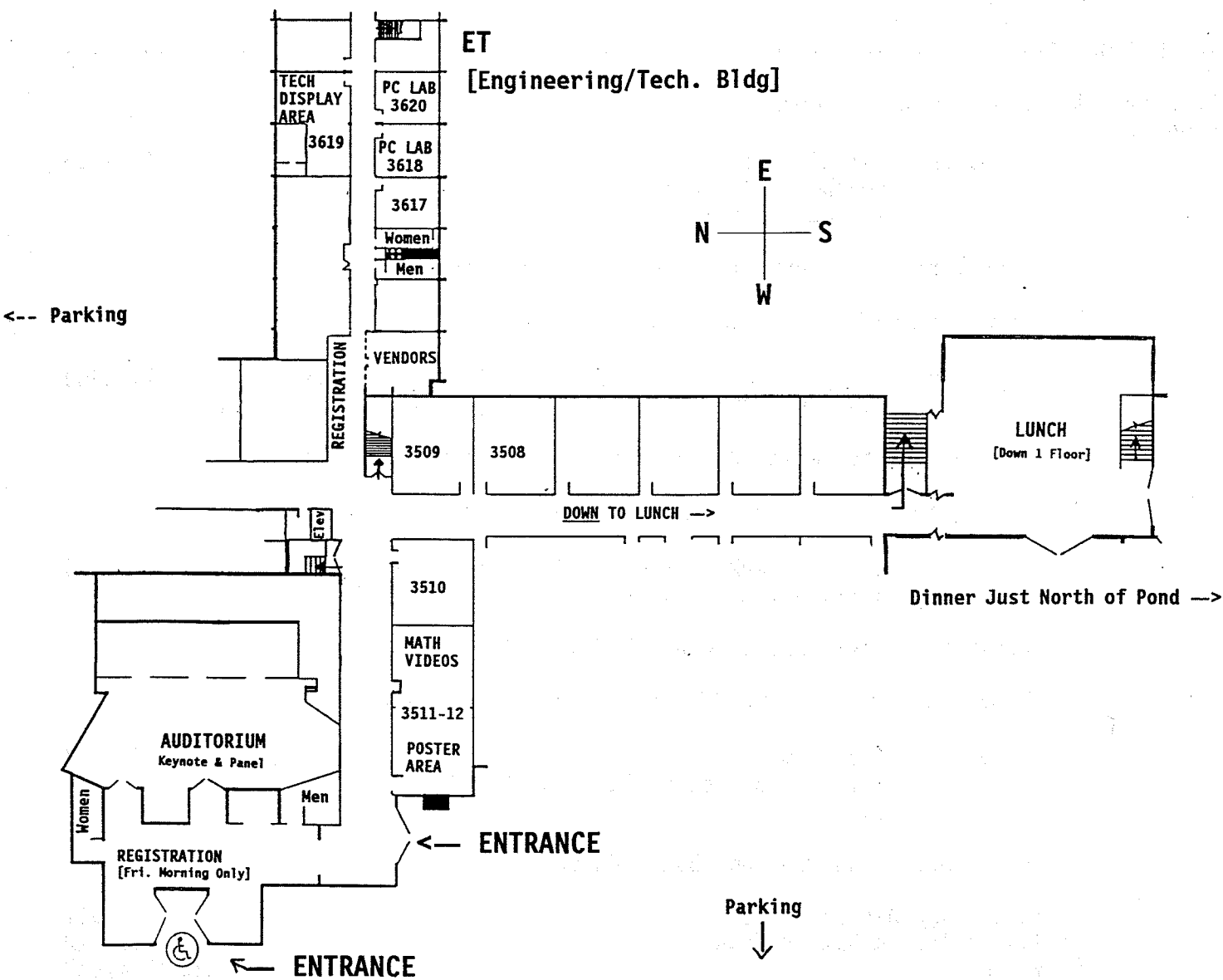# 4th Annual Greater Kansas City
MATHEMATICS TECHNOLOGY EXPO

SCHEDULE
OF EVENTS

OCTOBER 7 & 8, 1994
Kansas City Kansas Community College

ET

[Engineering/Tech. Bldg]

TECH DISPLAY AREA

3619

PC LAB 3620

PC LAB 3618

3617

Women

Men

E

N —— S

W

<-- Parking

REGISTRATION

VENDORS

3509

3508

DOWN TO LUNCH —>

LUNCH
[Down 1 Floor]

Elev

3510

MATH VIDEOS

3511-12

POSTER AREA

Dinner Just North of Pond —>

AUDITORIUM
Keynote & Panel

Women

Men

<— ENTRANCE

REGISTRATION
[Fri. Morning Only]

Parking
↓

<— ENTRANCE

FRIDAY OCT. 7

8:00 am	REGISTRATION	Auditorium LOBBY
- 2:30 pm	-------------> From 11:30 am - 2:30 pm move to HALL in "CENTRAL VENDORS AREA"	

| 9:00 am | WELCOME & INTRODUCTIONS | AUDITORIUM |
| - 10:20 am | | |

Richard Delaware, University of Missouri, Kansas City, MO
1994 EXPO Planning Committee Chairman

Tom Burke, President of Kansas City Kansas Community College

KEYNOTE ADDRESS

Writing Programs in a Mathematical Programming Language: The Really Powerful Way of Using Technology to Help Students Learn Mathematics

Ed Dubinsky, Purdue University,
Editor of UME Trends [Undergraduate Mathematics Education]

QUESTIONS

------SESSION 1--

10:30 am   **A:** *Solving Exotic Equations*
- 11:20 am

      Speaker: Samuel Lynch,   ET 3508
                 Southwest Missouri State University, Springfield, MO
                 [TI-81, TI-82]

      Presider: Andy Bennett, Kansas State University

B: *Active Learning in a Math Resource Center*

      Speaker: Libby Holmgren, Math Resource Center Supervisor,   ET 3509
                 Johnson County Community College, Overland Park, KS

      Presider: Kay Weiss, Kansas City Kansas Community College

C: *Testing, Selecting, and Implementing New Mathematics Curricula*

      Speakers: William Barker, Bowdoin College, Brunswick, MAINE,   ET 3510
                 Anita Salem, Rockhurst College, Kansas City, MO

      Presider: David Ewing, Central Missouri State University

D: *Enhancement of Learning of Mathematics by Software Tools*

      Speaker: Atul Roy,   ET 3617
                 Culver-Stockton College, Canton, MO
                 [IBM]

      Presider: Jean Johnson, Baker University

E: Technology Display Area   ET 3619
F: Poster Area & Math Videos   ET 3511-12
G: Vendors   "Central Area"

FRIDAY OCT. 7 (con.)

------SESSION 2--

11:30 am - 12:30 pm	**A: PANEL DISCUSSION:** *A Skeptical Look at Technology in Mathematics: What Good is Done?*	AUDITORIUM

Moderator: Bob Adams, University of Kansas, Lawrence, KS

Panelists: Ed Dubinsky, Purdue University, IL
Jean McCann, East Central College, Union, MO
Connie Schrock, Emporia State University, Emporia, KS
Ray Wilbur, Lawrence High School, Lawrence, KS

B: Technology Display Area	ET 3619
C: Poster Area & Math Videos	ET 3511-12
D: Vendors	"Central Area"

12:30 pm   LUNCH   LOWER LEVEL (See Rooms Map)
- 1:20 pm   also, Visit Vendors (Central Area), Technology Display Area (ET 3619), etc.

------SESSION 3--

1:30 pm   **A:** *What Effect Has the TI-82 Had on College Algebra at the University of*
- 2:20 pm   *of Kansas? Survey and Trends*

Speaker: Marilyn Carlson,   ET 3509
University of Kansas, Lawrence, KS

Presider: Ken Eichman, MCC, Blue Springs Campus

B: *Forging a Basis for Parametric Plotting*

Speaker: John Cigas,   ET 3510
Rockhurst College, Kansas City, MO
[MAC]

Presider: Nic LaHue, Penn Valley Community College

C: *Linear Algebra Using Matlab*

Speaker: Thomas Cairns,   ET 3617
University of Tulsa, Tulsa, OK
[IBM]

Presider: Bob Adams, University of Kansas

2:00 pm   **D: WORKSHOP:** *Parametric Equations on the TI-85*
- 4:00 pm
Speaker: Kay Dundas,   ET 3508
Hutchinson Community College, Hutchinson, KS
[TI-85 Calculators Provided; Max: 30.]

Presider: John Koelzer, Rockhurst College

E: Technology Display Area	ET 3619
F: Poster Area & Math Videos	ET 3511-12
G: Vendors	"Central Area"

FRIDAY OCT. 7 (con.)

2:30 pm   A: *How We Use Technology Throughout Our Mathematics Curriculum*
- 4:00 pm

        Speakers: Lynda Hollingsworth, Dennis Malm,   ET 3509
                   Kurtis Fink, and Mark Sand,
                   Northwest Missouri State University, Maryville, MO
                   [TI, IBM]

        Presider: Libby Holmgren, Johnson County Community College

    B: *Learning Theory and Programming as Components of Curriculum Reform
in Discrete Mathematics and Abstract Algebra*

        Speaker: Ed Dubinsky,   ET 3510
                  Purdue University, IL

        Presider: Andy Bennett, Kansas State University

    C: WORKSHOP: *Everything You Wanted to Know About the HP 48G*

        Speaker: Bob Adams,   ET 3617
                  University of Kansas, Lawrence, KS
                  [HP 48G Calculators Provided; Max: 30.]

        Presider: Nic Lahue, Penn Valley Community College

    D: WORKSHOP: *The Eclectic Lab: Six Unusual PC/Calculator Labs
For Calculus I and II*

        Speaker: Richard Delaware   ET 3620
                  University of Missouri - Kansas City, MO
                  [IBM, SHARP]

        Presider: Kay Weiss, Kansas City Kansas Community College

    E: Technology Display Area   ET 3619
    F: Poster Area & Math Videos   ET 3511-12
    G: Vendors   "Central Area"

SATURDAY OCT. 8

8:00 am   REGISTRATION   HALL in "CENTRAL VENDORS AREA"
- 1:30 pm

------SESSION 5--

9:00 am   A: *Spreadsheets For Fun and Profit*
- 9:50 am

            Speaker: Andy Bennett,   ET 3508
                          Kansas State University, Manhattan, KS
                          [IBM]

            Presider: Ken Eichman, MCC, Blue Springs Campus

B: *The Use of Technology: When is it Beneficial or Harmful?*

            Speaker: Steven Wilson,   ET 3509
                          Johnson County Community College, Overland Park, KS
                          [TI]

            Presider: Libby Holmgren, Johnson County Community College

C: *Teaching, Learning, and Writing Mathematics Using* <u>*Scientific WorkPlace*</u>

            Speaker: Elbert Walker, Consultant for TCI Software, and   ET 3617
                          Emeritus New Mexico State University
                          [IBM]

            Presider: Richard Delaware, University of Missouri - Kansas City

D: MATH EXPO POSTER/SHARING SESSION!

           Organizers: Bob Adams, University of Kansas,   ET 3511-12
                         John Koelzer, Rockhurst College

E: Technology Display Area   ET 3619
F: Math Videos   ET 3511-12
G: Vendors   "Central Area"

------SESSION 6--

10:00 am   A: *Geometric Investigations*
- 10:50 am

            Speaker: Bill Parker,   ET 3617
                          Kansas State University, Manhattan, KS
                          [IBM]

            Presider: David Ewing, Central Missouri State University

SATURDAY OCT. 8 (con.)

------SESSION 6 (Continued)---

10:00 am - 11:30 am	**B: WORKSHOP:** *A 'Sharper Image': The SHARP EL-9300C Graphics Calculator and its Use in College Algebra*	

       Speaker: Wayne Martin, Kansas City Kansas Community College   ET 3508
               [SHARP Calculators Provided; Max: 30.]

       Presider: Marian Van Vleet, Saint Mary College

C: WORKSHOP: *The TI-82, TI-85, and the New TI CBL in Calculus and Science*

       Speaker: Philip Buechner,   ET 3509
               Cowley County Community College, Arkansas City, KS
               [TI-82 and TI-85 Calculators Provided; Max: 30.]

       Presider: Bob Adams, University of Kansas

D: WORKSHOP: *An Introduction to <u>Derive</u>*

       Speaker: Ken Eichman,   ET 3618
               Metro. Community Colleges, Blue Springs Campus, MO
               [IBM]

       Presider: Nic Lahue, Penn Valley Community College

E: WORKSHOP: *Graphing with <u>Green Globs</u>: Beginning Algebra Through College Algebra*

       Speaker: Libby Holmgren,   ET 3620
               Johnson County Community College, Overland Park, KS
               [IBM]

       Presider: Kay Weiss, Kansas City Kansas Community College

      F: Technology Display Area   ET 3619
      G: Poster Area & Math Videos   ET 3511-12
      H: Vendors   "Central Area"

11:30 am - 1:00 pm	**LUNCH**	LOWER LEVEL (See Rooms Map)

        also 30 min. FREE TIME, Visit Vendors (Central Area),
               Poster Area/Math Videos (ET 3511-12),
               Technology Display Area (ET 3619)

SATURDAY OCT. 8 (con.)

------SESSION 7---

1:00 pm   A: *Graphics Calculators in Actual Use*
- 1:50 pm

        Speaker: Jean McCann,   ET 3509
                    East Central College, Union, MO
                    [TI]

        Presider: Jean Johnson, Baker University

       B: *Why Reinvent the Wheel? How to Borrow Good Lab Ideas From the Best Sources*

               Speaker: Kay Weiss,   ET 3617
                    Kansas City Kansas Community College, KS
                    [IBM]

        Presider: Libby Holmgren, Johnson County Community College

1:00 pm   C: WORKSHOP: *Linear Programming and Quadratics with <u>Derive</u>*
- 2:30 pm

               Speaker: Carol Jean Martin,   ET 3618
                    Dodge City Community College, KS
                    [IBM]

        Presider: Ken Eichman, MCC Blue Springs Campus

       D: WORKSHOP: *Beginning <u>Geometer's Sketchpad</u>*

               Speaker: David Ewing,   ET 3620
                    Central Missouri State University, Warrensburg, MO
                    [IBM]

        Presider: Nic Lahue, Penn Valley Community College

       E: Technology Display Area   ET 3619
       F: Poster Area & Math Videos   ET 3511-12
       G: Vendors   "Central Area"

------SESSION 8---

2:30 pm   A: *College Algebra Without Tests: The Sequel*
- 3:20 pm

           Speakers: Jeff Frost, and Cathleen O'Neill,   ET 3508
                    Johnson County Community College, Overland Park, KS

        Presider: Jean Johnson, Baker University

       B: *Programming in <u>Derive</u>*

               Speaker: Jeffery Solheim,   ET 3617
                    Emporia State University, Emporia, KS
                    [IBM]

        Presider: Marian Van Vleet, Saint Mary College

------SESSION 8 (Continued)---

2:30 pm C: WORKSHOP: *Alternative Teaching Techniques Using Technology*
- 4:00 pm *and Writing in Mathematics*

        Speaker: Julane Crabtree,   ET 3618
                Johnson County Community College, Overland Park, KS
                [IBM; TI-82 Calculators Provided; Max: 30.

        Presider: David Ewing, Central Missouri State University

D: Technology Display Area   ET 3619

E: Poster Area & Math Videos   ET 3511-12

THE 1994 EXPO ENDS - See You Next Year!

1994 EXPO PLANNING COMMITTEE

Richard Delaware - CHAIRMAN 1994
University of Missouri - Kansas City

Bob Adams
University of Kansas

Jean Johnson
Baker University

Andy Bennett
Kansas State University

John Koelzer
Rockhurst College

Ken Eichman
MCC, Blue Springs Campus

Nic LaHue
MCC, Penn Valley Community College

David Ewing
Central Missouri State University

Marian Van Vleet
Saint Mary College

Libby Holmgren
Johnson County Community College

Kay Weiss
Kansas City Kansas Community College

ABSTRACTS

FRIDAY, OCT. 7, 1994

KEYNOTE ADDRESS

■ *Writing Programs in a Mathematical Programming Language:*
The Really Powerful Way of Using Technology to Help Students Learn Mathematics

Ed Dubinsky
Purdue University, Editor of UME Trends (Undergraduate Mathematics Education)

■ There are many forms of technology which can be and are being used in education. This talk will focus on one category of such technology: computers and calculators.

The first part of the talk will compare and contrast the various ways in which computers and calculators can be used to help students learn mathematics. Each of the approaches to be discussed has its advantages and disadvantages which I will summarize, together with some examples. I will argue that having students make computer constructions to implement mathematical concepts can be extremely effective in helping them construct their understandings of these concepts.

The last part of the talk will present some examples of how this strategy for using computers in education can be implemented in college level courses, including Discrete Structures, Calculus, and Abstract Algebra. Finally, I will give some indications of the results of using these methods.

Session 1

A: *Solving Exotic Equations*

Samuel Lynch
Southwest Missouri State University

Courses Targeted: Honors Courses

Audience: College

Length: 50 minutes

■ Implementation of TI-81 and TI-82 graphing calculators in locating Real and Complex roots of unusual equations. The equation: $x^{10} - 2^x = 0$ will be used in demonstration.
Ideas for:
- ■ Topics for Honors Courses
- ■ Curriculum Revision
- ■ Undergraduate Research

B: *Active Learning in a Math Resource Center*

Libby Holmgren
Johnson County Community College

Courses Targeted: Fundamentals of Math through Differential Equations

Audience: High School, College

Length: 50 minutes

■ This presentation will describe the Math Resource Center (MRC) at Johnson County Community College (JCCC). 5500 students take math classes each semester, and their use of the MRC adds up to 60,000 hours of usage each year. Though there has been a Math Resource Center at JCCC for more than 10 years, the focus and philosophies surrounding the MRC have shifted in the intervening years. The physical layout of our center has changed a number of times until locating in a new 3000 sq. ft. facility designed specifically for us one year ago. In the last five years, the center has seen an increase in usage of more than 130%. The MRC is devoted to serving JCCC math students, assisting them on a drop-in basis. A variety of resources are offered, including free peer tutoring, group study sessions, videotapes, and computer programs. Students do homework and study for exams in the MRC, using the resources and requesting help as needed. Many instructors require certain assignments to be done on the computers in the MRC.

The atmosphere in the Math Resource Center is its most important quality, in that students of <u>all</u> levels (from Fundamentals of Math through Differential Equations) feel at ease, knowing that they are welcome and can receive assistance if needed. The backbone of the center is the people who serve the students - the tutors, receptionists, technician and supervisors. We provide an environment where students can work individually or meet together to study. The philosophy is basically that we help those that help themselves. Tutors may not be reserved. Rather, it is the students' responsibility to get started on their work, and ask for assistance when they need it and when a tutor is free. The students are aware that they must make the most of the time with the tutor, since the tutor cannot stay longer than between 5 and 15 minutes with them. If a student is "lost," it is suggested that they view a videotape, which they do on their own in our videoroom, again making them accountable for their learning, and active in the process. As each semester proceeds we see students meeting in the MRC to do their math together and to discuss their homework with each other. In addition, tutoring techniques that encourage active learning are encouraged, and studied during our inservice.

This session will include but not be limited to:

- ■ A brief history of the MRC at JCCC
- ■ Peer tutor qualifications, interviewing, and training
- ■ Receptionists and supervisor
- ■ Resources available in the MRC (specific software, videotapes, solutions manuals)
- ■ The planning of the new center: how's and why's
- ■ The specific layout of the center (general study room, small group rooms, quiet room, computer room, video room)
- ■ How the center is used
- ■ Policies

- Usage statistics (how many students use the center, what courses they are in, and the various reasons they come.)

As all math programs continue to face attrition and drop-out rates that are too high, the Math Resource Center at JCCC works in tandem with the instructors here, providing a learning environment that has proved successful for many students. Strong anecdotal evidence exists from students that many could not have made it through their math courses (or would not have had the degree of success they did have) without the combination of our instructors and the MRC. In supporting the MRC, our college has made a significant commitment to the math students at JCCC. We believe we have a tried and proven working model that could work on many different levels.

C: *Testing, Selecting, and Implementing New Mathematics Curricula*

William Barker
Bowdoin College

Anita Salem
Rockhurst College

Courses Targeted: Calculus, All College Math Courses

Audience: High School (grade 12), College

Length: 50 minutes

■ Mathematics reform has produced a number of new curricula which not only alter the topics being covered with a particular course but also the manner in which the topics are covered. For example, most of the reform calculus courses include a laboratory component, group learning activities, extensive emphasis on reading and writing mathematics, and longer open ended assignments. This discussion, led by William Barker who has developed *Mathematica* versions of the Duke University Project CALC laboratories and Anita Salem who has been testing these materials, will focus on the challenges inherent with exploring new curricula and new methodologies.

D: *Enhancement of Learning of Mathematics by Software Tools*

Atul Roy
Culver-Stockton College

Courses Targeted: Linear Algebra, Elementary Statistics, Precalculus

Audience: High School, College

Length: 50 minutes

■ This presentation will demonstrate:

- The use of Master Grapher for the teaching of precalculus using a graphing approach.

- The use of MINITAB in teaching of elementary statistics in saving time on calculations and doing simulations for better understanding of the ideas.

- The use of DERIVE in linear algebra assignments.

Session 2

A: **PANEL DISCUSSION:** *A Skeptical Look at Technology in Mathematics: What Good is Done?*

Moderator: Bob Adams
        University of Kansas

Panelists: Ed Dubinsky   Connie Schrock
        Purdue University   Emporia State University

        Jean McCann   Ray Wilbur
        East Central College   Lawrence High School

<u>Length:</u> 50 minutes

■   The Panel will limit their presentations so that there will be ample time for the audience to ask questions of each panel member. This is your opportunity to not only ask questions, but also to get responses on your favorite problem in using the new technology. Some of the questions facing the Panel are:

   1. What are the advantages of a computer laboratory or the use of hand calculators?
   2. With the availability of programmable calculators which have built-in differentiation and integration capabilities, how should a final examination be structured?
   3. Reform calculus: What was wrong with the old calculus?
   4. Etc.

Bring your questions and opinions.

Session 3

A: *What Effect Has the TI-82 Had on College Algebra at the University of Kansas? Survey & Trends*

Marilyn Carlson
University of Kansas

<u>Courses Targeted:</u> College Algebra

<u>Audience:</u> College

<u>Length:</u> 50 minutes

■   Graphing technology has been full integrated into the curriculum for all sections of college algebra, affecting approximately 2500 students annually. The role of the calculator in our curriculum is to enhance student

understanding, generate student interest and involvement, and increase student confidence. Calculators are used during class as a demonstration tool by the instructor. Students are encouraged to bring their calculators to class and are frequently required to work in groups to solve problems using their calculator. Calculators are allowed when completing homework and exam questions.

The impact of incorporating graphing technology into the curriculum at the University of Kansas will be discussed. Survey results concerning the impact of technology on student and teacher attitudes will be reported. Trends in performance before and after the introduction of graphing technology will be provided.

Specific calculator questions included on exams will be shown, along with the computational requirements of these questions. Sample demonstrations and conceptual connections made by the classroom teacher will be illustrated. A brief look at how technology has impacted the ordering of topics and content emphasis of our college algebra course will be described.

Surveys were administered to approximately 2000 students, completing college algebra during the last academic year, with a fully integrated calculator curriculum. The questions explored student attitudes concerning how technology has affected their understanding, computational abilities and interest, as well as their potential for success in future math courses. The results of these surveys will be reported.

Teachers' attitudes towards graphing calculators as an instructional tool will also be reported. Surveys were administered to approximately 40 teachers of college algebra who were required to individually incorporate graphing technology into their classroom activities. The surveys report their perception of what effect graphing technology has had on student understanding, interest, and computational abilities, as well as the classroom environment.

Calculator centered projects have been added as a collaborative learning activity. The students are required to work in groups of three or four to complete a written and oral report. The projects require students to use the information taught in the course to solve a challenging and unfamiliar problem. Students need to use their calculator to demonstrate and explore as part of the project requirement. The benefits of including a project as part of the course requirements will be discussed. Projects will be given as handouts to those attending the session.

Finally, I will discuss the support and guidance provided to our teaching staff. Details concerning pre-service calculator workshops, training and classroom observations will be described. Written support materials provided to classroom teachers will be given as handouts. Factors which I believe have contributed to a successful transition to a calculator integrated curriculum will be identified.

B: *Forging a Basis for Parametric Plotting*

John Cigas
Rockhurst College

Courses Targeted: Calculus, Numerical Analysis

Audience: College

Length: 50 minutes

In this talk, we illustrate the use of parametric plotting by reproducing hand-written signatures with a 5-6 statement Mathematica program. The general process is to

- Determine X & Y coordinates of key points of a signature (this can be done by using graph paper or other methods)
- Define these sequences of points in Mathematica
- Create interpolating functions from these lists
- Use the interpolating functions and parametric plotting to draw the signature.

The only part of the Mathematica program that changes is the control points, so this program can be used by anyone who can find and list (X,Y) coordinates.

This program then serves as a basis for discussing the concept of parametric plotting for graphs which are not true functions.

This process also illustrates the ability to recreate complex designs by only storing a few control points. This is much more space efficient than storing bit-mapped images. It also motivates a discussion on which points in the signature make good control points.

The final topic is that of piecewise interpolating functions. This part of the talk can range from a simple overview to a more detailed discussion of how to construct these functions. The details are conveniently hidden by Mathematica, so while they are interesting, they are not critical to understanding and using the program.

Sample Program:

```
xpoints={70,50,47,73,72,46,44,83,73,76,92,89,83,117,125,
          106,99,104,113,118,130,134,140,153,160,166,172};
ypoints={106,89,50,105,151,181,136,93,98,109,101,95,93,83,63,
          51,106,98,88,99,91,95,90,94,93,93,93};
xt=Interpolation[Table[{t,xpoints[[t]]},{t,1,Length[xpoints]}]];
yt=Interpolation[Table[{t,ypoints[[t]]},{t,1,Length[xpoints]}]];
firstname=ParametricPlot[{xt[t],yt[t]},{t,1,Length[xpoints]}]
```

C: *Linear Algebra Using Matlab*

Thomas Cairns
University of Tulsa

Courses Targeted: Linear Algebra

Audience: College

Length: 50 minutes

Linear algebra is a subject in which there can be exploited an intricate interplay between theory, algorithm and computation. Algorithms such as row reduction and Gram-Schmidt orthogonalization can be used both to prove theorems about the important ideas of Euclidean spaces and to provide computed solutions to applied problems. They are also the basis for the important matrix decompositions: LU, QR, Cholesky and SVD. These algorithms can yield student insight into the fundamental ideas of linear algebra such as independence, nonsingularity, null spaces, general solutions to systems of equations and the like. The decompositions mentioned above are the basic tools of the practitioners of linear algebra. They are implemented in Matlab and will be used to illustrate, investigate and experiment with the subject matter covered in a first course in linear algebra.

6

During the summers of 1992 and 1993 there were a total of ten ATLAST workshops held around the country under NSF sponsorship. There were typically forty participants each. These were for the purpose of investigating the use of technology, especially Matlab, in the teaching of linear algebra. In order to receive a stipend, participants were required to submit formal projects which they used and tested. In June, 1994 a final workshop will be held at UC San Diego to accumulate these projects into a publication. I am an invited participant in that workshop and will be able to <u>report the results at the Math EXPO</u>.

D: **WORKSHOP:** *Parametric Equations on the TI-85*

Kay Dundas
Hutchinson Community College

<u>Courses Targeted:</u> Calculus III

<u>Audience:</u> College (Some calculator experience expected)

<u>Length:</u> 2 hours

■   I plan to start with basic techniques for graphing parametric equations on the TI-85 calculator, and investigate several graphs, inverses, translation and rotation of axes. The eventual focal point will be curvature. We will graph circles of curvature and centers of circles of curvature for several graphs. Calculators will be provided.

Session 4

A: *How We Use Technology Throughout Our Mathematics Curriculum*

Lynda Hollingsworth,
Dennis Halm,
Kurtis Fink,
Mark Sand
Northwest Missouri State University

<u>Courses Targeted:</u> College Algebra, Calculus I & II, Multivariate Calculus,
Discrete Math, Numerical Analysis, Linear Algebra

<u>Audience:</u> College

<u>Length:</u> 90 minutes

■   At Northwest Missouri State University we use technology in several classes and in a variety of applications. We will give a presentation discussing our experiences and implementation of these methods.

  ■ Lynda Hollingsworth - College Algebra - TI-85 graphing calculators
  ■ Dennis Malm - Calculus I and II - TI-85

- Kurtis Fink - Multivariate Calculus - Mathematica, Discrete Mathematics - Matlab
  Numerical Analysis - Matlab
- Mark Sand - Linear Algebra - Matlab

B: *Learning Theory and Programming as Components of Curriculum Reform in Discrete Mathematics and Abstract Algebra*

Ed Dubinsky
Purdue University

<u>Courses Targeted:</u> Discrete Mathematics, Abstract Algebra

<u>Audience:</u> College

<u>Length:</u> 90 minutes

■ In a sense, this talk will be an extension and elaboration of the last part of the Keynote Address. I am involved in a number of research and curriculum development projects including one in Discrete Mathematics and one in Abstract Algebra. The latter is a recipient of major funding from the National Science Foundation. In all of these projects our work is based on research in how people learn and our courses make use of innovative pedagogical strategies such as cooperative learning and de-emphasis of lecturing as well as the use of computers as described in the Keynote Address.

In this workshop I will describe these courses in some detail emphasizing the connections with theories of learning, cooperative learning, small group problem solving and programming. Again I will indicate what we have in the way of evaluation of the success of these projects.

C: **WORKSHOP:** *Everything You Wanted to Know About the HP 48G*

Bob Adams
University of Kansas

<u>Courses Targeted:</u> Mathematics, Science, Engineering

<u>Audience:</u> College

<u>Length:</u> 90 minutes

■ It is becoming more common to use hand calculators at both the high school and undergraduate levels for mathematics instruction. A well known calculator is the TI series. Lesser known is the Hewlett Packard 48G series. This is a considerably more powerful calculator and is the choice for students who will major in the hard sciences or engineering. This hands-on workshop will demonstrate the power of the calculator by demonstrating both internal (hard wired) and external (author's programs) programs. The transfer of programs by both hard wire and infrared will be demonstrated.

D: **WORKSHOP:** *The Eclectic Lab: Six Unusual PC/Calculator Labs for Calculus I and II*

Richard Delaware
University of Missouri-Kansas City

Courses Targeted: Calculus I & II

Audience: College

Length: 90 minutes

■ Six labs, for Derive alone, with the SHARP EL-9300C graphics calculator, or with the Univ. of AZ Freeware, will be presented. Then participants will have time to test them all themselves. Copies of the labs will be distributed; All have been tested in several university Calculus I or II classes. The labs are:

- The Findpoly Mystery Game [Univ. of AZ Freeware.]
- Holly's Bicycle Race [Student Research Projects in Calculus]
- The Bus Trip Lab
- Area Properties of Cubic Curves: An Exercise in Theorem-Proving [Leinbach]
- That Dam Project! [Arney]
- The Flowering of Polar Roses

[For a companion to this workshop see Kay Weiss' talk, Sat. Oct. 8, 1:00-1:50 pm, Room ET 3617.]

SATURDAY, OCT. 8, 1994

Session 5

A: *Spreadsheets for Fun and Profit*

Andy Bennett
Kansas State University

Courses Targeted:

Audience:

Length: 50 minutes

■ Why can you make a fortune in real estate with no money down? How can millionaires like Donald Trump go bankrupt? How can spreadsheets make concepts like convexity more clear and relevant to our students? We will discuss all this and more, and in only 50 minutes with no easy payments required!

B: *The Use of Technology: When is it Beneficial or Harmful?*

Steven Wilson
Johnson County Community College

<u>Courses Targeted:</u> Algebra through Calculus

<u>Audience:</u> High School, College

<u>Length:</u> 50 minutes

■ Several mathematics education organizations have issued statements regarding the use of technology. The manner in which classroom instructors use (or don't use) technology has important implications for the quality of education students receive. This presentation will examine ways in which technology is used well, and <u>ways in which it may harm the students.</u> Some principles and specific examples will be provided to stimulate discussion. The goal is to make each instructor more aware of the implications of the decisions they make concerning how they use technology in their classroom.

C: *Teaching, Learning, and Writing Mathematics Using <u>Scientific WorkPlace</u>*

Elbert Walker
Consultant for TCI, & Emeritus Professor New Mexico State University

<u>Courses Targeted:</u> Calculus, Linear Algebra

<u>Audience:</u> High School, College

<u>Length:</u> 50 minutes

■ <u>Scientific WorkPlace</u> is a new product developed by TCI Software Research with the aid of National Science Foundation SBIR grants as a successor to <u>Scientific Word</u>. <u>Scientific WorkPlace</u> (= <u>Scientific Word</u> + <u>Maple V</u>) is a convergence of scientific/technical word processing and Computer Algebra System technologies. You can easily enter mathematical expressions in natural notation, manipulate the expressions, and answers are generated directly in your document in text-based format. The versatility of this product makes it a natural classroom tool which can be used interactively by teachers and students alike. Teachers can develop lessons in an "interactive document" format which are tailored to the ability of their students. Students learn by doing and seeing complex expressions being manipulated before their very eyes. A full demonstration of <u>Scientific WorkPlace</u>'s capabilities will be given and we will explore the possible applications in the classroom.

D: MATH EXPO POSTER/SHARING SESSION!

Organizers: Bob Adams
                   University of Kansas

               John Koelzer
               Rockhurst College

Audience: Everyone

Length: 50 minutes, then open all day

■ The poster room will provide an informal opportunity for you to bring your new ideas in using technology to a forum where you can share them with other members of the EXPO. Posters, handouts or more (or less) elaborate presentation methods are welcome.

The presenter may if he or she wishes give times when they will be available in the poster room for more in-depth discussion of their ideas.

Session 6

A: *Geometric Investigations*

Bill Parker
Kansas State University

Courses Targeted: Geometry

Audience: High School, College

Length: 50 minutes

■ In Dr. Parker's college geometry course, prospective high school mathematics teachers use Geometer's Sketchpad to carry out investigations and present their results. In this presentation the setting and nature of these investigations will be described, sample investigations will be demonstrated, and the implications of this approach will be discussed.

B: **WORKSHOP:** *A 'Sharper Image': The SHARP EL-9300C Graphics Calculator and Its Use in College Algebra*

Wayne Martin
Kansas City Kansas Community College

Courses Targeted: College Algebra

Audience: College

Length: 90 minutes

■ This workshop will introduce the Sharp EL-9300C graphics calculator. Several modes of the calculator will be explored, such as the computation mode using equation editing (where the expression appears on screen as it would on paper), and the graphing mode with all its corresponding features, such as tracing, zooming, and "jumping" to points of intersection, minimum and maximum values, and x and y intercepts. If time permits, the programming and statistics modes will also be looked at. Examples from a pre-calculus course where this calculator is used throughout the semester will be presented.

C: **WORKSHOP:** *The TI-82, TI-85, and the New TI CBL in Calculus and Science*

Philip Buechner
Cowley County Community College

<u>**Courses Targeted:**</u> Precalculus, Calculus, Business Calculus

<u>**Audience:**</u> High School, College

<u>**Length:**</u> 90 minutes

■ Participants will be introduced to applications of the TI-82 and TI-85 calculators to precalculus and calculus through the use of handouts, selected demonstrations, and hands-on experience. TI-82 and TI-85 loaners will be provided by Texas Instruments. The new <u>C</u>alculator-<u>B</u>ased-<u>L</u>ab unit (CBL) will be demonstrated. (Loaners of the CBL are not available.)

D: **WORKSHOP:** *An Introduction to <u>Derive</u>*

Ken Eichman
Metropolitan Community Colleges, Blue Springs Campus

<u>**Courses Targeted:**</u> All

<u>**Audience:**</u> High School, College

<u>**Length:**</u> 90 minutes

■ This workshop is for the uninitiated, for those who want to know what Derive can do or how to get started with it. A small amount of time will be used to learn how to configure the program (setting graphics mode, colors, etc.) and how to load and save files. The majority of the time will be used for as many of the following topics as time allows: Entering expressions, evaulating expressions and modifying expressions by substitution, factoring polynomials, solving algebraic and trigonometric equations, defining and evaluating functions, defining and row-reduction of matrices, graphing functions, plotting points, simple curve-fitting, graphing piece-wise continuous functions, graphing parametric equations, differentiation, definite integrals, indefinite integrals, limits, polar curves, and solving systems of linear equations.

E: **WORKSHOP:** *Graphing with <u>Green</u> <u>Globs</u>: Beginning Algebra Through College Algebra*

Libby Holmgren
Johnson County Community College

<u>**Courses Targeted:**</u> Intro. to Algebra, Intermediate Algebra, College Algebra, Calculus

<u>**Audience:**</u> High School, College

<u>**Length:**</u> 90 minutes

■ "Green Globs and Graphing Equations" is a software package in 4 parts:

- ■ **Equation Plotter** - Students type in equation(s). The equations are graphed on a grid provided. Discovery can happen and comparisons can be made. Students may use lines, parabolas, circles, ellipses, hyperbolas, absolute value, square root, natural log, exponential, the 6 trig functions, and arctan.

- ■ **Linear and Quadratic Graphs** - The computer graphs lines, parabolas, circles, ellipses, hyperbolas, or mixed graphs. The student "guesses" the equation of each figure given. If s/he is correct, the guess is graphed and s/he is asked to try again.

- ■ **Green Globs** - 13 "green globs" appear on the screen. The student types in one equation at a time and watches it be graphed. They can use equations of any of the following: lines, parabolas, circles, ellipses, or hyperbolas (depending on the wishes of the instructor and/or the level of the student). The goal is to "shoot" at all the globs, accumulating points. The more globs hit with each equation, the more points received. This can be great fun as well as a learning tool.

- ■ **Tracker** - The student finds the equations of several hidden graphs. The hidden graphs may be lines, parabolas, circles, ellipses, or hyperbolas, but there will be only two types of graphs for each game. There are 2 kinds of "shots": probes and trackers.

I will go through all 4 parts of the program, and give some suggestions as to how it could be specifically used in instruction. This is not a tutorial package, but rather a graphing program. It could be used as a discovery tool, as practice for newly acquired knowledge, or to have fun in mathematics. It could be used as a demonstration, but would most effectively be used by having students do various assignments with it. Students could work either individually or in pairs. It is wonderful for Beginning Algebra students, and can also work really well for students in Advanced Algebra and Calculus classes.

Session 7

A: *Graphics Calculators in Actual Use*

Jean McCann
East Central College

<u>Courses Targeted:</u> Intermediate Algebra, College Algebra

<u>Audience:</u> High School, College

<u>Length:</u> 50 minutes

■   A how-to and why-should-I talk about the graphing calculator in the classroom. Topics to be covered include:

■ What classes can I use it in to justify the cost?
■ Should students be required to purchase or should the school provide?
■ Why a graphing calculator?
■ Why now?

- Some solid examples of its use in College Algebra.
- The effect on lecturing, homework, and testing.

The classroom experience must have some relevance to real life - we promote this concept each time we write goals and objectives which refer to "problem solving skills" and "applications in other disciplines". The time has come to stand behind these goals and objectives and use the technology available by making it part of what we do in our mathematics classes. Real life embraces technology that enhances and simplifies daily chores - so should educators embrace technology in the classroom. This is NOT a how-to -use the graphics calculator talk - what this will endeavor to be is a WHY use the graphics calculator in your classrooms and, more importantly, a HOW to teach with the graphics calculator.

B: *Why Reinvent the Wheel? How to Borrow Good Lab Ideas from the Best Sources*

Kay Weiss
Kansas City Kansas Community College

<u>Courses Targeted:</u> Calculus I, Calculus III

<u>Audience:</u> High School, College

<u>Length:</u> 50 minutes

■ In the last few years, numerous lab manuals and Calculus Reform materials with suggested uses for technology have become available. I have found that while no one author seems able to write a computer or calculator manual I would want my students to buy, each has a few great ideas which when combined with ideas from others provide excellent critical thinking activities. Examples of "combination" labs developed for Calculus I and III using Derive will be presented. A list of some of the better sources available will be offered. Suggestions for incorporating technology into the standard Calculus classroom will be given.

[For a companion to this talk see Richard Delaware's WORKSHOP, Fri Oct. 7, 2:30-4 pm, Room ET 3620.]

D: WORKSHOP: *Linear Programming, and Quadratics with <u>Derive</u>*

Carol Jean Martin
Dodge City Community College

<u>Courses Targeted:</u> Algebra II (High School), Precalculus, College Algebra

<u>Audience:</u> High School, College

<u>Length:</u> 90 minutes

■ The linear programming example will illustrate graphing, scaling, and solving systems with Derive. Using quotation marks to describe the solution will be utilized. The second example, a quadratic application, will illustrate graphing, scaling, and centering. The commands Manage and Substitute will be employed throughout.

E: WORKSHOP: *Beginning Geometer's SketchPad*

David Ewing
Central Missouri State University

Courses Targeted: Geometry (High School through College)

Audience: High School, College

Length: 90 minutes

■ Learn to teach Geometry in grades 2-16 using a MAC or IBM compatible computer with Geometer's SketchPad. (No previous knowledge of the software is assumed.) After several, classroom-tested lessons are presented, participants will be instructed in the basics and guided in developing their own class lessons.

Session 8

A: *College Algebra Without Tests: The Sequel*

Jeff Frost,
Cathleen O'Neill
Johnson County Community College

Courses Targeted: College Algebra

Audience: College

Length: 50 minutes

■ The Use of Technology in Writing Across the Curriculum

This is a continuation of last year's presentation which discussed writing in place of traditional testing as a way to evaluate students' understanding of college algebra concepts. The initial motivator to change evaluation methods was the increasing availability of graphing calculators. The presenters will begin with a brief summary of the teaching assessment techniques. The emphasis will be on specific examples of student expectations, student writing problems, and students' achievement (both the perception of their achievement and their actual achievement in subsequent courses.)

B: *Programming in <u>Derive</u>*

Jeffery Solheim
Emporia State University

<u>Courses Targeted:</u> College Algebra, Calculus, Linear Algebra

<u>Audience:</u> College

<u>Length:</u> 50 minutes

■ Derive, a computer-algebra system, is becoming a popular tool of teachers and students alike to simplify expressions, solve equations, graph functions, and perform matrix calculations. One can also program in Derive, and, in this demonstration, you'll learn how to iterate, execute conditional expressions, and define functions.

C: **WORKSHOP:** *Alternative Teaching Techniques Using Technology and Writing in Mathematics*

Julane Crabtree
Johnson County Community College

<u>Courses Targeted:</u> College Algebra, Business Calculus, Intermediate Algebra, AG Calculus I

<u>Audience:</u> High School, College

<u>Length:</u> 90 minutes

■ Using technology on a regular basis can be a welcome break from the routine of the classroom. Labs and projects that require the student to analyze what is happening on the screen allow the instructor to use the discovery method of delivery as an alternative to lecture. In addition, students feel more ownership of material which they have discovered for themselves. This workshop will provide several of these labs and discovery activities using DERIVE and the graphing calculator for College Algebra and Business Calculus I. These activities also require that students write about their experiences and draw conclusions from their data and observations. Evaluative methods for these will be discussed. Activities can be adapted for the calculator or the computer in many cases.

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