Course Portfolio for MATH 2080 – Calculus III

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Course Portfolio Working Group
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Statement of Teaching Philosophy
DRAFT

Vlajko L. Kocic

This statement reflects my teaching philosophy at this moment. As a teacher, I am also a learner, a scholar, and a researcher. I am constantly learning: in the classroom from students, from peers, from literature, and other sources. The scholarly approach to teaching directs toward the improvement of my teaching in order to better facilitate students' learning. My permanent involvement in the research in the discipline has a strong influence to my teaching. That is why my teaching philosophy is continuously changing and that is why this document is still only a "draft". Probably I will have a definite statement of teaching philosophy when I finish my teaching career.

The following few components, I believe, determine, and together make a skeleton of my philosophy of teaching.

- **Active and Collaborative Learning** - I am trying to design and promote a classroom atmosphere where students are active participants and not passive listeners. Active learning techniques (handouts, group work, projects, and others) help students to develop better conceptual understanding of mathematics and positive attitude toward it. Discovery and exploration, used as methods for introducing new concepts, are very exciting for students and stimulate their active participation. Collaboration, sharing ideas, work on common projects are some elements in the learning process which help students to develop mathematical creativity.

- **Connections -** Establishing connections between mathematics and other disciplines and emphasizing on relationships between different areas within mathematics are necessary in preparing students to recognize wide applicability of mathematics.

- **Technology -** Today, as never before, we have access to such powerful computing tools that we were not able to imagine only few years ago. For some of us that is scary, and for some that is a challenge. It is here, around our students and us, so I think, we have to find the way to incorporate it in our teaching. I cannot pretend that powerful graphing calculators and computer software packages do not exist and teach the same way as a few years ago. However, the other extreme perception about the technology, that it will replace other traditional approaches, is also not completely acceptable. The technology is a powerful tool, which, if properly used, might help students to reach further than ever before.
- **Critical Thinking -** As the mathematics teacher, the development of critical thinking skills in my students is one of my major goals. For me it is more important to teach

student to understand how to solve the problem, what the obtained solution means, and to know how to distinguish acceptable solution from those that are not, than to teach them only how to apply algorithms. I am sharing a view accepted by many mathematicians: “I do not want to make my students to become a bad imitation of a calculator which costs less than 100 dollars.’’

- **Writing -** Being able to articulate mathematical ideas means being able to understand them, and being able to apply them. Mathematics has its own universal language that needs to be learned. Solving a problem is only a first step and students should learn how to write an obtained solution in mathematically correct way.

- **Skills -** A student, who has developed basic skills, is self-confident, prepared to comprehend advanced mathematical concepts, and apply them in solving complex problems. Students without basic skills are frightened, confused, and resistant to accept and learn new concepts.

- **Mathematical Ideas -** To enjoy the beauty of mathematics a student should develop a basic understanding of fundamental mathematical ideas and the role of rigor in this discipline. Discovery and exploration in the initial stage of introducing new concepts, use of technology and other educational means to make hypothesis, will not generate complete understanding of a mathematical idea, if it is not formulated in the rigorous way and proved, if necessary. I believe that in any mathematics course (regardless of the level) there should be a space to develop some concepts rigorously and to prove certain facts.

Reflection on how the course goals and objectives fit into the discipline, department goals, and the mission of Xavier University of Louisiana

Vlajko L. Kocic

The Mathematics Department, as a part of Xavier University has multiple roles: (a) to educate and successfully prepare mathematicians for workforce and/or graduate schools; (b) to provide broad population of Xavier graduates with operating knowledge in mathematics; (c) to train students majoring in science and engineering how to use and apply various mathematical techniques in their respective disciplines.

MATH 2080 – Calculus III is four credit hours course and it is the final course in the Calculus sequence taught at Xavier University. Calculus sequence is a backbone of any standard mathematics program in the world. It is also an integral part of a proper training of computer scientists, physicists, chemists, and engineers. It provides students with a variety of tools and techniques for solving complex mathematics problems in three-dimensional space.

Course goals and objectives of the portfolio for Calculus III

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COURSE PHILOSOPHY (From Calculus III Syllabus)

The purpose of this course is to provide a clear understanding of the ideas of *calculus* - one of the greatest achievements of the human intellect - as a solid foundation for subsequent courses in mathematics and other disciplines. We will emphasize:

- *Depth of understanding* rather than breath of coverage
- *Multiple representations* to encourage reflection on the meaning of concepts
- *Development of mathematical thinking* - acquisition of a clear intuitive picture of the central ideas, reason with the intuitive ideas, and explanation of the reasoning clearly in plain English
- *Active learning*, through large group discussion sessions and small group working sessions
- *The use of technology*, by training students how use own judgment to determine where technology is useful for graphing and performing other tasks.

COURSE GOALS (From Calculus III Syllabus)

1. To make students thoroughly familiar and comfortable with the functions of two variables - using graphical, numerical, verbal, and modeling approaches.
2. To give students a thorough understanding of the vectors and their algebra.
3. To make students familiar and proficient in finding the partial derivatives, differentials, directional derivatives, and gradients of functions of several variables.
4. To enable students to find local and global extrema (with and without constrains).
5. To give students a practical understanding of the multiple integrals.
6. To give students an understanding of the idea of line integral.
7. To give students an understanding of the idea of the flux integral.
8. To give students an understanding of the idea of vector fields and the curl and divergence of a vector field.
9. To give students an understanding of three fundamental theorems: Green's, Sokes and Divergence.

LEARNING OBJECTIVES (From Calculus III Syllabus)

After completing this course the student should be able to:

- Know to interpret, graph, differentiate functions of several variables
- Apply graphical, numerical, and algebraic skills to modeling the real world
- Use a graphing calculator to graph functions of several variables and to find the equation of a function
- Find the partial derivative numerically by taking an arbitrarily fine difference quotient

- Be familiar with vectors and their algebra, and their applications
- Know and understand basic concepts of analytical geometry in three dimensional space
- Determine, apply, and interpret directional derivative, and gradient of a function of several variables
- Use first and second derivatives to find local and global (with and without constrains) extrema of functions of several variables
- Be able to evaluate double, triple, and iterated integrals in Cartesian and other coordinate systems.
- Represent parametric curves and apply them to motion, velocity, and acceleration
- Understand the concept of vector fields
- Be able to compute curl and divergence of vector fields
- Know how to compute line integrals
- Understand the conservative fields, gradient fields
- Apply the Fundamental Theorem of Calculus for Line Integrals and Green's Theorem
- Understand the concept of parameterized surfaces
- Know how to flux integrals
- Compute flux integrals over selected surfaces
- Apply Stokes' and Divergence Theorems

FOCUS OF THE COURSE PORTFOLIO

In fall 2001 Calculus III was enriched with computer lab component. In summer 2001, the course materials including the handbook "Exploring Multivariable Calculus with DPGraph", and set of computer labs for software DPGraph were developed. During fall 2001 Calculus III classes met once a week in the computer lab. The assessment performed during fall 2001 indicated areas that need some improvement. For example, in spring 2002 classes are meeting three times per week in the computer lab and the computer assignments are more incorporated in lectures. In general, students overwhelmingly accepted this approach, and some of their suggestions are included in the development of this proposal. However, problems with the computer lab (outdated and unreliable computers, delay in reconstruction) prevented the full integration of the computer lab component in later semesters. In addition, in fall 2002 the new edition of the textbook was introduced and therefore the computer lab component was revised. Recently, the works on the reconstruction of computer labs are completed and the lab is operational.

One of the essential components in this course, and at the same time one of most challenging for students is the graphical representation of three-dimensional objects: surfaces, curves, and solids. In solving problems, students need to sketch graphs of various surfaces and, in general, to have some background in geometry in three-dimensional space. Mostly, the correct graphical representation of three-dimensional objects is only a starting point in understanding and solving problems. Unfortunately, a number of students in this course have very limited previous experience with three-dimensional space. Limited capabilities of graphing calculators for graphing in three dimensions did not help enough in resolving this problem.

The focus of the course portfolio for Calculus III is to determine the effects of use of technology for visualization (set of computer lab assignments developed for software DPGraph) to improvement of students' learning. Therefore, the focus is not a specific course objective, but the impact of computer lab component to practically entire set of learning objectives and the course in general.

Assessment plan

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For the assessment of the project, a variety of methods will be used. A sample of the journal, and a draft of the survey are enclosed.

- *Journals* - At the end of each lab students will answer few short questions about the effectiveness of the class and goals achieved.
- *Survey* - At the end of the semester a detailed survey will be conducted to address overall effectiveness of the project.
- *Portfolio* - Examples of students' work will be collected and become a part of this portfolio
- *Student Evaluation* - Student evaluation results will be used for assessment.

Final observations and reflections

This project confirmed that the computer lab component in Calculus III is and it should remain an integral part of the courses. Based on students' responses in daily journals and in final survey, my classroom observations, the computer labs became essential tool to help students to visualize objects (curves, surfaces, solid) and their relationships in three-dimensional space. However, this project indicated that there are few areas needing some interventions, so the computer lab component becomes fully integrated in the course structure.

Assessment plan was conducted as planned with the following findings:

- Students were very satisfied with the content and structure of handbook. The handbook helped to majority of students to better understand key concepts in the course. They do not recommend elimination of any part. Review was very beneficial for students both in the lab and for future references.
- Assignments were understandable, clearly written, with the description of commands to be used for their completion. They helped students in understanding of applications of Calculus III. Assignments were somewhat challenging for half of the student body, and not always related to the appropriate topic. Most assignments were related to entire chapter and in some cases (because lab met only once a week) students were not previously exposed to the material.
- Visualization using DPGraph software significantly helped students to improve their understanding relationships between objects (curves, surfaces, solids) in three-dimensional space. Examples were interesting and illustrative. In particular, students emphasized the quality of graphical representations, animations, and prepared examples.
- Students were satisfied with the work in the computer lab. They agreed that the most important topics are covered. Labs helped them to significantly improve their performance in the course. The weight assigned to computer lab component in calculating final grade was appropriate. Grading policy was fair. They found that the time allocated for labs was not appropriate – labs were too long.
- As possible improvements students suggested better correlation between labs and material covered, incorporating labs into lectures, and more projects (group and individual). The need for the group work was also stressed. They also suggested that the labs should include mostly short examples, but should contain some complex problems. They were divided regarding the putting lab assignments on the web. Also some students pointed the expansion of the labs to topics not presently covered.

In addition to students' comments, I found some additional things that need attention. At the present, this course is very demanding regarding its contents. In many schools, this course carries five credits hours, instead of four. Integration of computer lab takes additional time from lecture part and makes the course very sensitive to unexpected events. For example, hurricane Ivan in fall 2004 created the situation that the whole course was restructured, including the elimination of some labs. The major issues that need to be resolved are:

1. Development of additional labs that include topics not currently covered and updating the handbook accordingly. To accomplish this it is essential to secure funding due to excessive amount of work involved.
2. Developing a proposal for the Math Department and CAS Academic Council to add drill component (1 hour per week) to MATH 2080, so labs can be conducted in that time and not as a part of regular classes.

Finally, I would like to mention that there is an interest for this approach in wide mathematical community. During recent 17th International Conference on Technology in Collegiate Mathematics, I have conducted a computer mini-course "exploring Multivariable Calculus with DPGraph". The response of participants (about 20) was overwhelmingly positive. Each participant received the copy of handbook and lab assignments, learned basic features of the software, and get a grasp how to implement it in teaching multivariable calculus.

Spring 2004 Calculus III Date _____

Daily Journal

1. What is the most important concept you have learned today?

2. The amount of material covered in this lab was

   (a) appropriate for one day
   (b) more than should be covered in one day
   (c) less than should be covered in one day
   (d) no opinion

3. Computer lab exercises and examples we did today

   (a) helped me to significantly improve my understanding of covered topics
   (b) helped me to make minor improvement of my understanding of covered topics
   (c) did not have any effect to my understanding of covered topics
   (d) had negative effect to my understanding of covered topics.

Calculus III Survey

The purpose of this survey is to collect information about the students' experiences with computer lab component in Calculus III. The information collected will be used ONLY for future improvements. PLEASE DO NOT SIGN THE SURVEY.

Part I - Handouts

1. In general, the handouts helped me to better master the required skills in this course.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

2. In general, the handouts helped me to better understand the key concepts in this course.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

3. The brief review at the beginning of each handout contained the summary of key concepts related to the lab assignment.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

4. I used information from the review when I studied for quizzes and exams.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

5. Overall, the review was very helpful.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

6. The summary of DPGraph commands helped me to easily master the software.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

7. The summary of commands was appropriate to easily complete assignments.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

8. The descriptions of the commands were understandable.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

9. Assignments were clearly written.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

10. Instructions for completion of assignments were complete.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

11. The level of my preparation and mathematical skills was appropriate to successfully complete most of the assignments.

    a) YES b) NO

    If the answer is NO please complete the following: (*Check all that apply*)

    (a) Most assignments that I had difficulties with, emphasized:

    ___ Excessive computations.
    ___ Computations involving expressions with one of more parameters.
    ___ Excessive use of algebra.
    ___ Excessive use of graphing calculators.
    ___ Excessive use of concepts from previous mathematics classes.
    ___ Concepts (from Calculus III) not previously covered.
    ___ Learning of new concepts through exploration.
    ___ Graphical representations of 3-d objects.

    (b) My major difficulty in successfully completing assignments was the deficiencies in:

    ___ Algebraic skills.
    ___ Graphing calculators skills.
    ___ DPGraph skills.
    ___ Mathematics skills from previous mathematics classes.
    ___ Understanding of appropriate concepts from Calculus III.
    ___ Skills from Calculus III.

12. In assignments, the questions were strongly correlated to the appropriate topic.

    a) very challenging b) challenging d) appropriate e) easy f) no opinion

13. In assignments, the questions asked stimulated critical thinking.

    a) very challenging b) challenging d) appropriate e) easy f) no opinion

14. In general, the assignments (those that were actually completed during the lab) were

    a) very challenging b) somewhat challenging d) appropriate e) easy f) no opinion

15. In general, the assignments were

    a) very interesting b) somewhat interesting d) not interesting e) boring f) no opinion

16. In general, the assignments helped me learn more about the applications of Calculus III

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

17. In general, the assignments helped me to significantly improve my understanding of visual representation of 3-d objects.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

18. List three things that you find most useful in handouts.

    (a) _____

    (b) _____

    (c) _____

19. List three things in handouts that need improvements.

    (a) _____

    (b) _____

    (c) _____

20. General comments.

    _____

    _____

    _____

Part II - Visualization in 2-d and 3-d Spaces

1. In general, the computer labs helped me to better understand graphical representations of 2-d and 3-d objects.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

2. Exploration of surfaces and solids in 3-d space helped me to better understand key concepts in the course.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

3. Exploration of parametric curves in 2-d and 3-d spaces helped me to better understand key concepts in the course.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

4. Exploration of vector fields in 2-d and 3-d spaces helped me to better understand key concepts in the course.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

5. Animations are good tool in exploration of curves and surfaces.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

6. Computer labs assignments helped me to better understand relationships between an analytical representation (equation) and a graphical representation of functions of several variables.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

7. Computer labs assignments helped me to better understand graphical representations functions containing one or more parameters.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

8. Prepared dpg- files (provided on the disk) contained very illustrative examples.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

9. Prepared dpg- files (provided on the disk) contained a variety of examples.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

10. DPGraph was a good choice for visualtization..

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

11. It was easy to learn how to use DPGraph.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

12. The quality of graphical representations was excellent.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

13. List three labs you liked the most.

    (a) _____

    (b) _____

    (c) _____

14. List three labs that were most educative.

    (a) _____

    (b) _____

    (c) _____

15. General comments.

    _____

    _____

    _____

Part III - Class Structure

1. I was satisfied with computer labs.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

2. I enjoy working in the computer labs.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

3. Computer lab helped me to significantly improve the knowledge of the subject.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

4. The time allocated for the completion of assignments was (most of the time) appropriate.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

5. Computer labs were most of the time were well correlated to the lectures.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

6. Ten computer labs per semester is well balanced with the rest of the course

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

7. The most important topics in the course are addressed in the computer labs.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

8. Computer labs helped me to better perform on exams.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

9. Computer labs carry too much weight toward the final grade.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

10. Computer labs helped me to better follow lectures.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

11. Grading of computer labs was fair.

    a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

12. When I had problems in completing assignments that was mostly because:(*Check all that apply*)

    (a) ___ Assignments were too long to complete.
    ___ There were too many examples.
    ___ Examples contained material I was not familiar with.
    ___ Assignments required mathematical skills that I did not master.
    ___ I had problems with understanding of the assignments.
    ___ Examples were not related to material covered in the class.
    ___ I did not bring my disk so I had to wait to get another one.
    ___ Computers were not working properly.
    ___ I was late for classes.
    ___ I was surfing the web instead of working on assignments.
    ___ I did not review material covered in previous classes so I was not ready for labs.

13. List three major problems you had experienced in the computer lab setting.

    (a) _____

    (b) _____

    (c) _____

14. General comments.

    _____

    _____

    _____

Part IV - Possible Improvements

1. Assignments should be posted on the web instead of given to students as handouts.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

2. dpg-files(currently supplied on the disk) should be posted on the web.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

3. Web based organization will be more convenient.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

4. Review section of the assignments is unnecessary and should be eliminated.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

5. Summary of DPGraph commands used in the particular assignment is unnecessary and should be eliminated.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

6. It would be more appropriate to work on the short lab assignment at the time when the concept is introduced (or reinforced) instead of waiting for the "lab day".

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

7. Some long assignments should be given as group or individual projects.

   a) strongly agree b) agree d) disagree e) strongly disagree f) no opinion

8. Computer labs could be more useful for students if (*Check all that apply*)

   (a) ___ The number of labs is increased.
   ___ Only short examples are covered in the class.
   ___ Examples are focused on very narrow topic.
   ___ They are incorporated into lectures.
   ___ Long examples are given to students to complete as part of the homework.
   ___ Labs are better correlated with lectures.
   ___ The group work is more emphasized.

___ They are not counted toward the final grade.

9. The in-class assignments should (*Check all that apply*)

   (a) ___ Contain mostly short problems.
   ___ Include some complex problems.
   ___ Involve group work.
   ___ Not be graded.
   ___ Be limited to no more than 15 minutes of the class period.

10. The homework projects should (*Check all that apply*)

   (a) ___ Contain mostly long and complex problems.
   ___ Be assigned at least twice per semester.
   ___ Possibly involve group work.
   ___ Carry at least 10% of the final grade.

11. Make three suggestions how to improve computer labs.

   (a) _____

   (b) _____

   (c) _____

12. General comments.

   _____

   _____

   _____

Daily Journal - Lab # 1 (01/16/04)

1. What is the most important concept you have learned today?

   - Usage of the DPGraph
   - Contour diagrams
   - To use DPGraph
   - How to use DPGraph
   - I am really not clear
   - Contour diagrams
   - Cross sections and contour lines. Holding one variable constant provides the shape of the curves on 3d graphs.
   - How to use DPGraph
   - How to evaluate slices from different axes
   - Cross sections & contour diagrams
   - How to read 3d graphs
   - Cross sections on the z-axis
   - A better understanding of contour lines and cross sections

Daily Journal - Lab # 2 (01/21/04)

1. What is the most important concept you have learned today?

   - How to corelate/relate graphs to functions.
   - The difference between different surfaces.
   - How to identify graphs
   - I learned about contour diagrams and contour lines.
   - Different types of surfaces
   - The different surfaces
   - Using the software to determine contour lines and cross sections.
   - How to visually identify contours in different graphs and families of graphs.
   - It helped me to get a better understanding of 3d problems.

Daily Journal - Lab # 3 (02/06/04)

1. What is the most important concept you have learned today?

   - How to better use program.
   - Linear approximation
   - More about partial derivatives
   - Tangent of a 3d graph
   - The association between the analytical and geometric ways of solving for the tangent equation.
   - Partial derivatives
   - Partial derivative
   - Tangent plane
   - The important thing I learned about partial derivative
   - I received more practice on finding equation analytically
   - Tangents

Daily Journal - Lab # 4 (03/10/04)

1. What is the most important concept you have learned today?

   - Double integrals
   - I didn't learn anything. I guess I am more familiar with double integral
   - The effect of derivation order and limits in double integrals
   - Double integrals
   - Learn how to find limits of x and y
   - Reversing order of integration
   - Double integrals with applications
   - Evaluation and changing order of integrals
   - Double integrals
   - Changing limits and learning how to use the cfalculator
   - Evaluate double integrals
   - Reversing order of integrals
   - How to do this
   - Double integrals
   - How to "change the integral"

Daily Journal - Lab # 6 (03/24/04)

1. What is the most important concept you have learned today?

   - I didn't understand topic.
   - Periods and velocity at paratetric curves.
   - Helix calculations
   - Looking at graphs
   - The helicoidal
   - Parameter
   - How variables affect the motion of a particle.
   - How to determine valocity, speed, and acceleration.
   - Parametric curves
   - Time is not on our side
   - Acceleration, velocity, speed.
   - Work fast

Daily Journal - Lab # 8 (03/26/04)

1. What is the most important concept you have learned today?

   - Vector fields
   - Recognition of vector fields
   - Vector fields
   - Plotting vectors
   - Vectors
   - Vector fields
   - Manipulating vector fields
   - Sketching vector fields
   - Vector fields
   - Vector fields
   - Vector fields

2. The amount of material covered in this lab was

Lab#	appropriate for one day	more than should be covered in one day	less than should be covered in one day	no opinion
1	100% (13)			
2	67% (6)	22% (2)	11% (1)	
3	83% (10)		17% (2)	
4	71% (10)	7% (1)	21% (3)	
6	23% (3)	46% (6)	8% (1)	23% (3)
8	100% (12)			

3. Computer lab exercises and examples we did today

Lab#	helped me to significantly improve my understanding of covered topics	helped me to make minor improvement of my understanding of covered topics	did not have any effect to my understanding of covered topics	had negative effect to my understanding of covered topics
1	46% (6)	54% (7)		
2	78% (7)	22% (2)		
3	42% (5)	50% (6)	8% (1)	
4	36% (5)	50% (7)	7% (1)	7% (1)
6	23% (3)	62% (8)	15% (2)	
8	50% (6)	42% (5)	8% (1)	

Calculus III Survey

The purpose of this survey is to collect information about the students' experiences with computer lab component in Calculus III. The information collected will be used ONLY for future improvements. PLEASE DO NOT SIGN THE SURVEY.

Part I - Handouts

1. In general, the handouts helped me to better master the required skills in this course.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
	93% (13)			7% (1)

2. In general, the handouts helped me to better understand the key concepts in this course.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
14% (2)	72% (12)	7% (1)		7% (1)

3. The brief review at the beginning of each handout contained the summary of key concepts related to the lab assignment.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
29% (4)	57% (8)	7% (1)		7% (1)

4. I used information from the review when I studied for quizzes and exams.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
79% (11)	14% (2)	7% (1)		

5. Overall, the review was very helpful.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
64% (9)	29% (4)	7% (1)		

6. The summary of DPGraph commands helped me to easily master the software.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
29% (4)	57% (8)	7% (1)		7% (1)

7. The summary of commands was appropriate to easily complete assignments.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
36% (5)	43% (6)	14% (2)		7% (1)

8. The descriptions of the commands were understandable.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
29% (4)	57% (8)	7% (1)		7% (1)

9. Assignments were clearly written.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
36% (5)	50% (7)			7% (1)	7% (1)

10. Instructions for completion of assignments were complete.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
36% (5)	57% (8)				7% (1)

11. The level of my preparation and mathematical skills was appropriate to successfully complete most of the assignments.

a) YES	b) NO	No Answer
79% (11)	14% (2)	7% (1)

If the answer is NO please complete the following: (*Check all that apply*)

(a) Most assignments that I had difficulties with, emphasized:

___ Excessive computations. (1)
___ Computations involving expressions with one of more parameters. (0)
___ Excessive use of algebra. (1)
___ Excessive use of graphing calculators. (0)
___ Excessive use of concepts from previous mathematics classes. (0)
___ Concepts (from Calculus III) not previously covered. (1)
___ Learning of new concepts through exploration. (1)
___ Graphical representations of 3-d objects. (3)

(b) My major difficulty in successfully completing assignments was the deficiencies in:

___ Algebraic skills. (1)
___ Graphing calculators skills. (0)
___ DPGraph skills. (0)
___ Mathematics skills from previous mathematics classes. (1)
___ Understanding of appropriate concepts from Calculus III. (1)
___ Skills from Calculus III. (5)

12. In assignments, the questions were strongly correlated to the appropriate topic.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	64% (9)	29% (4)			7% (1)

13. In assignments, the questions stimulated critical thinking.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	50% (7)	36% (5)			7% (1)

14. In general, the assignments (those that were actually completed during the lab) were

a) very challenging	b) somewhat challenging	d) appropriate	e) easy	f) no opinion	No Answer
	50% (7)	36% (5)		7% (1)	7% (1)

15. In general, the assignments were

a) very interesting	b) somewhat interesting	d) not interesting	e) boring	f) no opinion	No Answer
21% (3)	57% (8)	14% (2)			7% (1)

16. In general, the assignments helped me learn more about the applications of Calculus III

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
21% (3)	71% (10)				7% (1)

17. In general, the assignments helped me to significantly improve my understanding of visual representation of 3-d objects.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
29% (4)	50% (7)	7% (1)		7% (1)	7% (1)

18. List three things that you find most useful in handouts.

- *The handouts gave visual representations*
- *They showed how different constants change the graph*
- *Clarity*
- *Follows with lecture topics*
- *Reviewing handouts*
- *Easily find formulas*
- *Less technical speech*
- *They are informative because they explain the key concepts*
- *Easy to understand*
- *They are very useful for studying*
- *Instructions*
- *Examples*

19. List three things in handouts that need improvements.

- *Clarity in the way the question is worded*
- *More issued*
- *More time to complete*
- *Less excessive/complicated verbage*
- *Clearer instructions*

20. General comments.

- *We should have more time in the class to understand what is being written on the board*
- *Hands-on applications are very stimulating but I needed more time to digest the volume of information*
- *The labs are fun assignments that helped me learn key concepts and earn points*

Part II - Visualization in 2-d and 3-d Spaces

1. In general, the computer labs helped me to better understand graphical representations of 2-d and 3-d objects.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
43% (6)	57% (8)			

2. Exploration of surfaces and solids in 3-d space helped me to better understand key concepts in the course.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
21% (3)	64% (9)			21% (3)

3. Exploration of parametric curves in 2-d and 3-d spaces helped me to better understand key concepts in the course.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
29% (4)	43% (6)	14% (2)		14% (2)

4. Exploration of vector fields in 2-d and 3-d spaces helped me to better understand key concepts in the course.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
21% (3)	50% (7)	21% (3)		7% (1)

5. Animations are good tool in exploration of curves and surfaces.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
64% (9)	36% (5)			

6. Computer labs assignments helped me to better understand relationships between an analytical representation (equation) and a graphical representation of functions of several variables.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
21% (3)	64% (9)	7% (1)		7% (1)

7. Computer labs assignments helped me to better understand graphical representations functions containing one or more parameters.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
21% (3)	36% (5)	29% (4)		14% (2)

8. Prepared dpg- files (provided on the disk) contained very illustrative examples.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
57% (8)	29% (4)	7% (1)		7% (1)

9. Prepared dpg- files (provided on the disk) contained a variety of examples.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
43% (6)	36% (5)	7% (1)		7% (1)

10. DPGraph was a good choice for visualtization..

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion
64% (9)	21% (3)			7% (1)

11. It was easy to learn how to use DPGraph.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
57% (8)	36% (5)				7% (1)

12. The quality of graphical representations was excellent.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
57% (8)	29% (4)	7% (1)			7% (1)

13. List three labs you liked the most.

- *Contour diagrams*
- *Labs 1, 3, 6*
- *Parametric functions, cross sections*
- *Contour diagrams*
- *Surfaces; elliptical paraboloid, hyperboloid, etc.;*
- *Don't remember names*
- *Chapter 6, 2, 7*
- *Don't remember*
- *Identifying surfaces*
- *The lab with all surfaces and graphs (1st one)*
- *The lab with x-slicing and y-slicing*
- *The lab with vectors*
- *The vector lab*
- *The first one with the 3d shapes*
- *Curves, solids, polar coordinates*

- *Labs 4, 1, 3*
- *Exploration of surfaces*

14. List three labs that were most educative.

- *Labs 8, 2, 4*
- *Cross sections, surfaces*
- *Surfaces*
- *Contour diagrams*
- *Chaper 6*
- *Vector fields*
- *Identifying surfaces*
- *They all were*
- *The same listed above (the vector lab; the first one with the 3d shapes)*
- *Curves, solids, polar coordinates*
- *Labs 1, 3, 4*
- *Double integrals and applications*
- *Triple integrals and applications*

15. General comments.

- *Handouts contain good examples*
- *Having a lab on flux and line integral would be great*
- *Some labs were helpful in learning the concepts*
- *All labs were useful and informative*

Part III - Class Structure

1. I was satisfied with computer labs.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
14% (2)	64% (9)	14% (2)			7% (1)

2. I enjoy working in the computer labs.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
21% (3)	64% (9)			7% (1)	7% (1)

3. Computer lab helped me to significantly improve the knowledge of the subject.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
21% (3)	50% (7)	14% (2)			7% (1)

4. The time allocated for the completion of assignments was (most of the time) appropriate.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	43% (6)	50% (7)			7% (1)

5. Computer labs were most of the time were well correlated to the lectures.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
36% (5)	50% (7)	7% (1)			7% (1)

6. Ten computer labs per semester is well balanced with the rest of the course

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	50% (7)	14% (2)	7% (1)	14% (2)	7% (1)

7. The most important topics in the course are addressed in the computer labs.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	36% (5)	50% (7)			7% (1)

8. Computer labs helped me to better perform on exams.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
21% (3)	14% (2)	14% (2)	7% (1)	36% (5)	7% (1)

9. Computer labs carry too much weight toward the final grade.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	14% (2)	36% (5)	7% (1)	36% (5)	7% (1)

10. Computer labs helped me to better follow lectures.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	50% (7)	21% (3)		21% (3)	7% (1)

11. Grading of computer labs was fair.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
36% (5)	50% (7)	7% (1)			7% (1)

12. When I had problems in completing assignments that was mostly because:(*Check all that apply*)

(a) ___ Assignments were too long to complete. (9)
___ There were too many examples. (3)
___ Examples contained material I was not familiar with. (6)
___ Assignments required mathematical skills that I did not master. (2)
___ I had problems with understanding of the assignments. (8)
___ Examples were not related to material covered in the class. (1)
___ I did not bring my disk so I had to wait to get another one. (0)
___ Computers were not working properly. (1)
___ I was late for classes. (1)
___ I was surfing the web instead of working on assignments. (0)
___ I did not review material covered in previous classes so I was not ready for labs. (7)

13. List three major problems you had experienced in the computer lab setting.

- *Difficulty having enough time to finish*
- *None*
- *Didn't understand instructions*
- *Needed more time*
- *Not all completetely undestanding assignment*
- *Too many examples for the time constrains*
- *Some examples inappropriate*
- *Time management*
- *No remembering covered topics*
- *Uncovered topics*
- *Didn't have adequate time to complete*

- *Lab setting didn't seem like a working environment*
- *Computer software wasn't always available*
- *Understanding some matrials*
- *Not enough time*

14. General comments

- *There was no major problem in CPU lab but sometimes labs were too long for 50 min; couldn't complete (maybe long)*
- *The setting is great; computers are fast and efficient*
- *Spend a little more time on labs*

Part IV - Possible Improvements

1. Assignments should be posted on the web instead of given to students as handouts.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	14% (2)	29% (4)	14% (2)	21% (3)	14% (2)

2. dpg-files(currently supplied on the disk) should be posted on the web.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
29% (4)	21% (3)	29% (4)		7% (1)	14% (2)

3. Web based organization will be more convenient.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	21% (3)	29% (4)	7% (1)	21% (3)	14% (2)

4. Review section of the assignments is unnecessary and should be eliminated.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
		36% (5)	50% (7)		14% (2)

5. Summary of DPGraph commands used in the particular assignment is unnecessary and should be eliminated.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	7% (1)	57% (8)	21% (3)		14% (2)

6. It would be more appropriate to work on the short lab assignment at the time when the concept is introduced (or reinforced) instead of waiting for the "lab day".

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
7% (1)	43% (6)	21% (3)		7% (1)	14% (2)

7. Some long assignments should be given as group or individual projects.

a) strongly agree	b) agree	d) disagree	e) strongly disagree	f) no opinion	No Answer
	64% (9)	14% (2)		7% (1)	14% (2)

8. Computer labs could be more useful for students if (*Check all that apply*)

(a) ___ The number of labs is increased. (5)
___ Only short examples are covered in the class. (7)
___ Examples are focused on very narrow topic. (3)
___ They are incorporated into lectures. (10)

___ Long examples are given to students to complete as part of the homework. (5)
___ Labs are better correlated with lectures. (4)
___ The group work is more emphasized. (7)
___ They are not counted toward the final grade. (0)

9. The in-class assignments should (*Check all that apply*)

   (a) ___ Contain mostly short problems. (7)
   ___ Include some complex problems. (5)
   ___ Involve group work. (7)
   ___ Not be graded. (0)
   ___ Be limited to no more than 15 minutes of the class period. (1)

10. The homework projects should (*Check all that apply*)

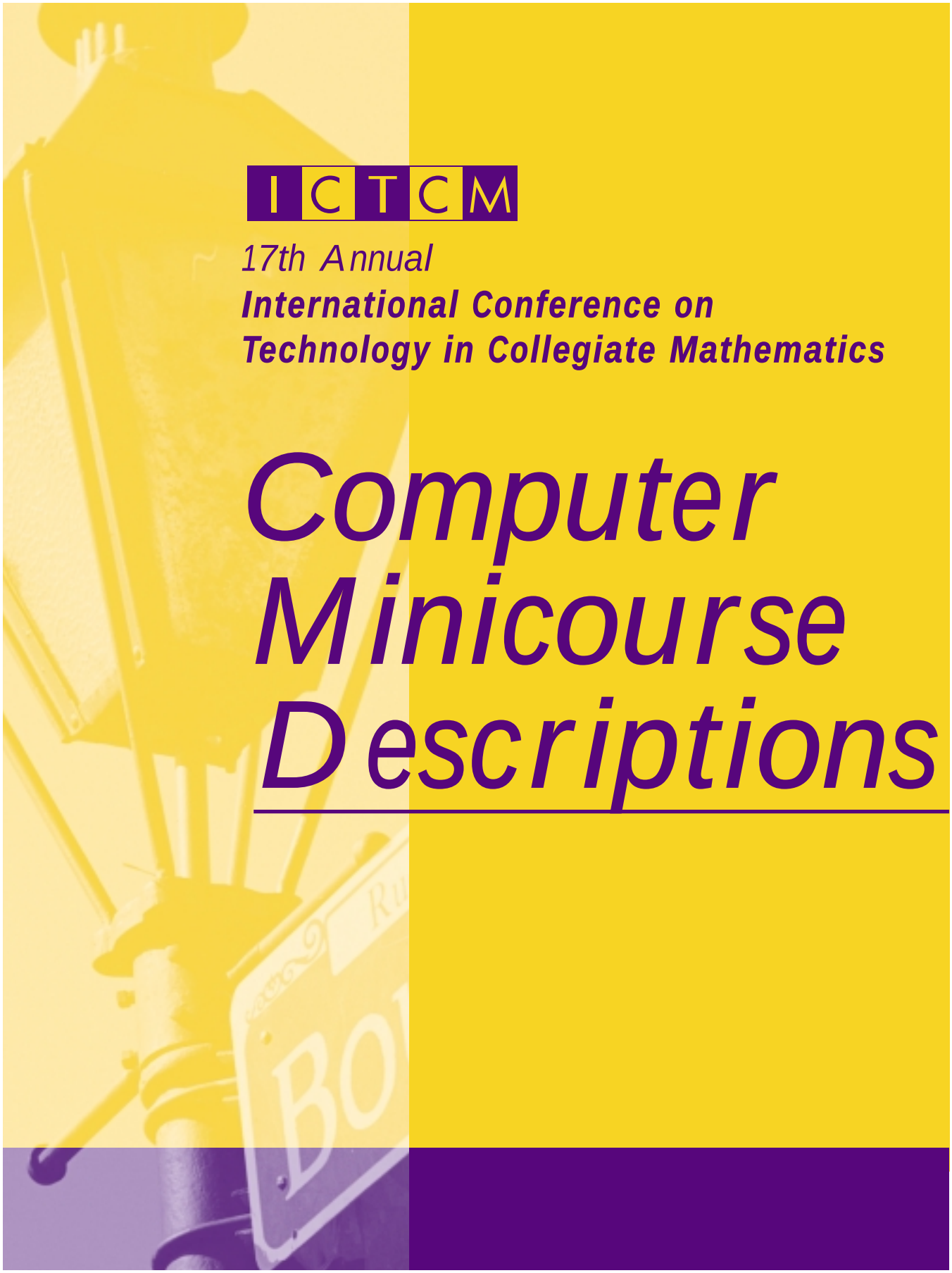
    (a) ___ Contain mostly long and complex problems. (2)
    ___ Be assigned at least twice per semester. (4)
    ___ Possibly involve group work. (6)
    ___ Carry at least 10% of the final grade. (3)

11. Make three suggestions how to improve computer labs.

    - *Do actual labs instead of just lectures*
    - *Make lab about one topic at the time*
    - *Not make them as long*
    - *Easy to follow examples*
    - *Group work involved*
    - *Community work effort*
    - *Longer time*
    - *Lecture during labs*
    - *Having homework that require use of DPGraph*
    - *Give project that involve researj on the web*
    - *Compure labs should be a visual presentation as well as examples provided*
    - *Provide better more delatiled examples*
    - *Labs should be to help student understand 3-d space and 2-d space, and students should not be graded*
    - *More time*
    - *Some gropu projects*
    - *If complex ling problems are involved allow group work*

12. General comments.

    - *The number of labs should be better spread during the semester. On the last module we had only one lab*



ICTCM

17th Annual

International Conference on Technology in Collegiate Mathematics

Computer Minicourse Descriptions

Friday, October 29, 2004

FRI - M1 **AN INTRODUCTION USING SMARTBOARD IN THE CLASSROOM**
Loyola A Judith Gathers, David Ray, *University of Tennessee at Martin*
10:30 AM - 12:15 PM

Participants will learn how to use various aspects of Smartboard from orienting to recording lecture notes. They will also be introduced to the use of Geometer's Sketchpad in connection with Smartboard.

FRI - M2 **MULTIVARIABLE CALCULUS WITH DPGRAPH**
Loyola B Vlajko Kocic, *Xavier University of Louisiana*
10:30 AM - 12:15 PM

DPGraph is powerful, simple-to-use dynamic visualization software for graphing 2d and 3d objects. A variety of in-class and homework assignments, group and individual projects are developed to enhance students learning in multivariable calculus. Minicourse participants will gain operational knowledge of DPGraph and learn how to integrate it into the classroom.

FRI - M3 **GETTING TO KNOW...GEOMETER'S SKETCHPAD**
Loyola A Carol Marinas, *Barry University*
12:30 PM - 2:15 PM

Have you heard of Geometer's Sketchpad? Been to a demonstration? Let's learn how to get started in the Sketchpad environment. Why wait? Learn the basics of Sketchpad through hands-on experiences. Develop methods of challenging your students through interactive activities.

FRI - M4 **JUMP-STARTING TECHNOLOGY IN THE CALCULUS CURRICULUM**
Loyola B Rosemary Carroll Farley, Patrice Tiffany, *Manhattan College*
12:30 PM - 2:15 PM

This minicourse is intended for faculty who want to incorporate MAPLE into calculus classes. Participants will learn enough code to be able to start using MAPLE immediately. They will received a booklet containing examples of the most important MAPLE commands, and examples of the most common errors made by students.

FRI - M5 **PMET: PREPARING MATHEMATICIANS TO EDUCATE TEACHERS - ELEMENTARY AND MIDDLE GRADES COURSES**
Loyola A Holly Hirst, Mary Searcy, *Appalachian State University*
3:00 PM - 4:45 PM

The MET report offers sage advice for improving the education of elementary and middle grades teachers. Of foremost importance is the need to develop a "deep understanding" of school mathematics. Technology can assist with this goal. We will focus on calculator and computer activities designed to engage students in mathematical explorations.

FRI - M6 **EXCELLENT TOOLS: CREATING INTERACTIVE WORKBOOKS USING MS EXCEL**
Loyola B Sarah Lou Mabrouk, *Framingham State College*
3:00 PM - 4:45 PM

Learn how to create applet-like interactive workbooks using the MS Excel Control Toolbox! Create workbooks containing user-manipulated objects such as scrollbars, buttons, and popups that make great classroom demonstrations and are valuable for assignments, projects, and guided learning tools for concept exploration.

Friday, October 29, 2004

FRI - M7
Loyola A
5:00 PM - 6:45 PM

B^2: BLACKBOARD BASICS

Cathy Ann Godbois, *DeVry University Online*
Yvette Nicole Johnson, Nicole Lloyd, *Lansing Community College*

Interested in developing a course in BlackBoard for use in a hybrid class or an ancillary site for a traditional lecture? Participants should bring sample class materials on a disk for use in the minicourse. The basics of BlackBoard will be introduced: announcements, control panel, gradebook, communication, assessment, and content areas.

FRI - M8
Loyola B
5:00 PM - 6:45 PM

FROM 2D TO 3D USING AUTOGRAPH

Douglas Butler, *ICT Training Center, Oundle School - United Kingdom*

A chance to discover new approaches to teaching coordinate geometry and calculus in both 2D and 3D using dynamic software.

Computer Minicourses

Saturday, October 30, 2004

SAT - M9
Loyola A
8:00 AM - 9:45 AM

CREATING AN INTERACTIVE MATH COURSE USING ADAPTIVE BOOK
Ananda Gunawardena, *Carnegie Mellon University*

In this minicourse, you will learn how to use existing digital content and/or integrate your own course material to create an interactive course package. Use of Adaptive Book software allows all digital content within the package to be marked up and shared with other users.

SAT - M10
Loyola B
8:00 AM - 9:45 AM

PICTURE IT WITH MATHEMATICA!
Debra Woods, *University of Illinois at Urbana-Champaign*

Participants in this minicourse will engage in a hands-on introduction to using Mathematica for visualizing math. Presenter will distribute notebooks from Math Teacher Link's "Using Mathematica in the Classroom."

SAT - M11
Loyola A
10:30 AM - 12:15 PM

MATLAB AS A TEACHING AND LEARNING TOOL IN THE MATHEMATICS CURRICULUM
Stephen Kane, Alan Davies, *University of Hertfordshire, United Kingdom*

In the University of Hartfordshire we use Matlab in the mathematics curriculum for teaching. The University funded teaching and learning initiatives have allowed us to develop a set of web-based workshops. We describe the resources and show how the workshops are embedded in our teaching.

SAT - M12
Loyola B
10:30 AM - 12:15 PM

USING THE TI-NAVIGATOR SYSTEM TO ENHANCE TEACHING AND LEARNING AT THE COLLEGE LEVEL
Linda Griffith, *University of Central Arkansas*

The TI-Navigator system will be used to show how communication between students and the instructor in mathematics classes can be enhanced using handhelds and a teacher computer.

SAT - M13
Loyola A
12:30 PM - 2:15 PM

VISUALIZATION OF SOLIDS OF REVOLUTION AND SOLIDS BY CROSS-SECTIONS USING MATHEMATICA
Nancy Ziegler, *Mason High School*

This calculus computer minicourse teaches the Mathematica statements used to create solids of revolution and the solids formed with cross-sections perpendicular to a given axis. It is designed to help students better visualize the solids and set up the integrals used to find the volume of these solids.

SAT - M14
Loyola B
12:30 PM - 2:15 PM

HOW TO REACH THE VISUAL AND AUDITORY LEARNER ON THE INTERNET WITH VIDEO
Scott McDaniel, *Middle Tennessee State University*

Using a relatively inexpensive software, TechSmith's Camtasia, one can readily create slideshow or full motion video tutorials that can be streamed onto the web in a variety of file formats (e.g. AVI, QuickTime, Flash, Real Player). The Virtual TI, an emulator for the TI calculators (e.g. 82,83,85,86,89), allows one to develop tutorials that are deliverable on the web.

Saturday, October 30, 2004

SAT - M15
Loyola A
2:30 PM - 4:15 PM

INTRODUCTION TO AiM (ASSESSMENT IN MATHEMATICS): A FREE LEARNING AND ASSESSMENT TOOL

Friedhelm Schwarz, *University of Toledo*

AiM is a noncommercial product for creation, administration, and grading of online homework, quizzes, and exams. The mathematical content is generated and graded in Maple; formula representation is delivered via LaTex. Participants will create a short exam containing algorithmically generated problems for a calculus-based course, featuring graphics, partial credit, and individualized feedback.

SAT - M16
Loyola B
2:30 PM - 4:15 PM

INTERCONNECTIVITY - DATA EXCHANGE BETWEEN DERIVE 6 AND TI HANDHELDS

Bernhard Kutzler, *Austrian Center for Didactics of Computer Algebra*

The new Derive 6 offers a powerful new feature called "interconnectivity", which allow data exchange between Derive and the TI CAS handhelds. In this hands-on workshop, you will learn to perform this data exchange and you will learn to use the combination of software and handheld as a powerful teaching and learning environment. Thus you will experience a very fine example of the slogan "The whole is more than the sum of its parts."

SAT - M17
Loyola A
4:30 PM - 6:15 PM

WRITING AND TEACHING WITH MAPLETS

Douglas Meade, *University of South Carolina*
Philip Yasskin, *Texas A&M University*

Maplets are JAVA applets written with Maple that retain all the algebraic computational power of Maple. You will will learn how to write Maplets and how to incorporate them into your calculus classes. We will also discuss the relative merits of the Maplet and worksheet environment.

SAT - M18
Loyola B
4:30 PM - 6:15 PM

FLASH AND SHOCKWAVE APPLICATIONS FOR TEACHING AND LEARNING MATHEMATICS

Doug Ensley, *Shippensburg University*
Frank Wattenberg, *U.S. Military Academy*

Macromedia Flash and Director are popular tools for building graphical interactivity into web pages with the aid of free Flash and Shockwave browser plug-ins.