California State University, San Bernardino
College of Natural Sciences, Mathematics Department
Math 241: Problem Solving in Calculus, Fall 2016

Course and Instructor Information

Instructor: Dr. Shawn McMurran
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Office hours: Tuesday & Thursday 2 – 3 pm; Monday & Wednesday 4 – 5 pm
Class Days/Time: Tuesday and Thursday, 10:00 – 11:50 am
Classroom: Jack Brown Hall 390
Course site: http://blackboard.csusb.edu/

Why are we here?

The National Council of Teachers of Mathematics states, "It is essential that teachers and students have regular access to technologies that support and advance mathematical sense making, reasoning, problem solving, and communication." In this course, we will explore ways in which we might use technology as a tool to help us solve challenging or computationally intense mathematical problems. Most of the problems we will consider will be drawn from the area of calculus. During the course you will become familiar with the geometry package *GeoGebra*, the computer algebra system *Mathematica or Maple*, spreadsheet software, and perhaps some online tools and applications.

Note that this is not a course in *how* to use any particular technology; rather, it is a problem-solving course that explores the role of technology as an effective problem-solving tool. Mathematics infiltrates the processes of everyday life, often without our awareness, through a powerful partnership with technology. Nearly every step of sending a text or making a call from your cellphone involves some sort of mathematics, from converting the number into sequences of bits, constructing an electromagnetic signal, to converting back to a message or sound of our voice. Computer animation and medical imaging make use the mathematics of compressed sensing. Eigenvectors play a key role in Google ranking algorithms. Computer simulations are a key component of mathematical modeling in scientific research, informing decision making in business and government, and controlling the complex systems used for transportation, utilities and supply chains. Encryption, automatic target recognition, signal processing, voice recognition software, analysis of traffic patterns, data mining, genetic sequencing, black holes, dark energy – understanding of each requires understanding of some mathematical concept. [Source*: Fueling Innovation and Discovery: The Mathematical Sciences in the 21st Century* by the National Research Council]

Student Learning Goals for the CSUSB Undergraduate Math Program

During their course of study in the mathematics undergraduate programs students will:

1. demonstrate a conceptual understanding of mathematics
2. attain procedural fluency in mathematics
3. demonstrate adaptive reasoning and problem solving skills in mathematics
4. demonstrate mathematical communication skills
5. understand and produce correct mathematical proofs

Each learning goal has a specified list of corresponding learning outcomes. Although many of these outcomes apply to this course, the particular outcomes that will be assessed are the following. For a complete set of SLOs applicable to your program please see: http://www.math.csusb.edu/index.php?main=programassessment.html.

1.3 Achieve proficiency in modeling with mathematics

3.1 Choose and use appropriate tools (including technology) and strategies to gain insight into and present solutions to mathematical problems.

Course Expectations

Labs will consist of problems in to be worked on in class. The tasks are designed to allow you to practice using technology as a tool in mathematical problem solving.

- Labs will be posted on BlackBoard with the due date indicated.
- Lab work will be assessed on mathematical correctness, appropriate use of technology, clarity of exposition and professional presentation.
- The majority of each lab assignment should be completed during class. Work that is not completed during the designated lab periods becomes homework.
- Any work submitted after the homework due date will be subject to an automatic 10% deduction of the assignment's total value for each week day that it is late.
- Some of assignments may be designated as "individual" assignments, but most will be "team" assignments. Each member of a team will receive the same score for a team assignment.
    - I reserve the right to lower an individual score if a student's contribution is deemed insufficient.
- Some classes will include an exit card that may include reflection and/or assessment questions. Exit card responses may be included as part of your lab grade.

Projects

We will have two projects, one individual and one team, due the last week of classes. Further information on the projects will be posted and discussed in class.

Class Participation and Attendance

- Attendance is required.
- Because of the interactive nature of this course, your participation is essential in creating a productive classroom environment. "Participation" means behavior that promotes learning for everyone. This includes staying on task as well as contributing ideas, suggestions, answers – and questions! – to discussion.
- More than one absence will result in an overall grade reduction. A second absence of 3 percentage points per class missed. Tardiness or early departure will count as partial absence.
- If missing a class is unavoidable, it is your responsibility to find out what you missed from another student or from the class BlackBoard site and arrange to do the required work on your own.
- If you miss class while working on a team assignment you must notify your teammate and me ahead of time so that arrangements can be made for your teammate to find a new partner.

Intellectual Honesty

You are encouraged to discuss assignments and work together with your classmates. However, individual work must be your own and must be written up independently. It is unacceptable to *copy* files or work from one another; doing so is considered plagiarism and will not be tolerated. Substantially identical assignments will receive no credit, regardless of who did the work. Note that simply changing variable names does not constitute an independent assignment. The only way to guarantee independent work is to do your own work *without* looking at another's work. Refrain from giving your work to a classmate to "look" at because you will share responsibility if it is copied, even if it is copied without your permission.

Collaborative work will undoubtedly lead to use of similar strategies and ideas. Be sure to give credit if you worked with someone else, used a classmate's idea, or used outside resources. Professionals always give credit where it is due using footnotes, bibliographies, references, and acknowledgements.

Grading Policy: Lab Assignments – 75% Projects – 25%

Grade Breakdown: A(93-100), A-(90-92), B+(87-89), B(83-86), B-(80-82), C+(77-79), C(73-76), C-(70-72), D+(67-69), D(63-66), D-(60-62), F(59 and below)

Important Dates

10/12 Census
11/11 Campus is closed for Veteran's Day
11/24 Campus is closed for Thanksgiving
12/6 Presentation of Project (during the final exam period 10 – 11:50 am)

Classroom Protocol

→ Please, be courteous to both your instructor and your classmates. It is unprofessional to text message or engage in off-task activities during class. Such activity may result in an absence for the day.

→ Lab printing privileges are included with this course. However, printing is monitored and abuse will result in revocation of printing privileges.

→ In the event that class is unexpectedly cancelled (e.g., fire, winds), it is your responsibility to check your campus email and BlackBoard for notifications concerning the material or assigned tasks that you will need to do for that day.

→ Plan to be on time for class and to stay for the entire class period. It can be disruptive to the class when students habitually arrive tardy and/or leave early. (I understand that extenuating circumstances may arise.)

University Policies

Services for Students with Disabilities
If you are in need of an accommodation for a disability in order to participate in this class, contact Services to Students with Disabilities at UH 183 (909) 537-5238, http://ssd.csusb.edu/. It is the student's responsibility to seek academic accommodations for a verified disability in a timely manner.

If you require assistance in the event of an emergency, you are advised to establish a buddy system with a buddy and an alternate buddy in the class. Individuals with disabilities should prepare for an emergency ahead of time by instructing a classmate and the instructor.

Dropping and Adding
You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. found at http://bulletin.csusb.edu/academic-regulations/. Note that drops after the census date are permitted only for serious and compelling reasons.

Plagiarism and Cheating
Students are expected to be familiar with the University's policy and strict guidelines regarding the issues of cheating and plagiarism. Please review this policy in the CSUSB Bulletin or at: http://bulletin.csusb.edu/academic-regulations/. "Plagiarism and cheating are violations of the Student Discipline Code. Plagiarism is the act of presenting the ideas and writing of another as one's own. Cheating is the act of obtaining or attempting to obtain credit for academic work through the use of any dishonest, deceptive, or fraudulent means." Instances of academic dishonesty will not be tolerated and will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified.

Socratic Teaching

I often respond to a question with another question. This response in no way means that I think your question is not legitimate, so please don't hesitate to ask or post questions. When I respond with more questions rather than a direct answer, I am demonstrating my faith in your ability to reach a correct conclusion. The question I respond with is meant to build on yours. I am acknowledging that you have made a step in the right direction and/or identified a key point. Or, perhaps you are not on the right track, but I believe you can find it with a nudge in the right direction. The intent of my question is to push you closer to discovering the answer on your own. Sometimes it takes a sequence of such questions to arrive at an answer.

I realize that the concepts we deal with in this class can be very challenging. Sometimes, it would be easier to simply provide the correct answer to a question. But, part of my job is to help you further develop your ability to think critically and problem solve. I believe that the answers we arrive at via our own reasoning lead to powerful learning.

This approach is called the Socratic method. By probing into a subject with questions, we develop an inquiring mind that can seek solutions to problems in a critical and logical way. This is a skill that potential employers look for and value.

So, please share your questions and comments! I value your input and it lets me see what you are thinking. And if I respond with another question, know that it is because I respect your ability to learn.

For more information on Socratic teaching, see http://www.criticalthinking.org/pages/socratic-teaching/606.

For more information on the Greek philosopher Socrates see http://plato.stanford.edu/entries/socrates/.