Summer Research Opportunities in Mathematics at CSB/SJU

The Mathematics Department has funding for two continuing CSB/SJU students to engage in undergraduate mathematics research in cooperation with faculty here. Also, students interested in mathematical biology or biostatistics can have their proposed advisors apply for Rooney funding. (Rooney funding happens quite early. Please contact faculty before January 31st.) Students interested in summer research should find a faculty sponsor in the Mathematics Department willing to work with the student. The student and faculty sponsor will choose one of the topics given below or propose another topic. The student then fills out the application on the last page and submits it electronically with a supporting e-mail from the sponsoring mathematics professor to Bret Benesh by February 18, 2013. The department will contact the students chosen to receive funding by February 28, 2013. If you have further questions, contact Bret Benesh: e-mail: bbenesh@csbsju.edu.

Logistical Information

Students will be employed full time (40 hours per week) for 10 weeks. Last year students earned $9.81 per hour for a total of $3924 plus $1455 for room and board. (This coming summer’s rate isn’t yet known.) Note: Social Security and withholding taxes must be deducted. Both CSB and SJU will provide a summer meal plan and housing, although the meal plans are different. Students should not have any other employment while they are doing the summer research. Students will meet regularly with their faculty advisors. The students and their advisors will decide the starting dates and ending dates, subject to the ten weeks of work, the constraints of the general research program and availability of rooms and meal plans. Students can be on either campus and will have access to library resources, computers and office space. They are encouraged and expected to participate in all activities organized for summer research students. They will share the results of their research in writing and at suitable forums, including a summer research seminar and, if appropriate, at Mathfest and the national Pi Mu Epsilon Conference from August 1 to 3 in Hartford, Connecticut and other conferences later, especially the Pi Mu Epsilon conference at St. Norbert College in November 2013 and our own Pi Mu Epsilon conference in April 2014. Travel funds to any conferences would be arranged.
Descriptions of Possible Research Topics

**Graph Theory with Anne Sinko.** Draw graphs and color them by looking at colored-parameters, study influence in network graphs, solve the bridges game. Want to name new graphical ideas? Pick from a list of defined, but unstudied, parameters! Other graph theory topics possible, too. Prerequisites: Math 239. Math 322 helpful, but not required.

**Visualizing Chaos with Bob Hesse.** Work on ways to visualize and understand the dynamics of iterative root-finding methods on the complex plane. Math 338, Math 346 or Programming experience preferred.

**Mathematical Biology with Bob Hesse or other mathematics professor and a biology professor.** Develop and explore a mathematical model for a biological system. Past students have studied competition in mosquitoes, assortative mating, protein regulation, three species competition, and metapopulations. Projects need to be developed with a biology professor. Contact Bob Hesse for updates on possible projects. Note the Jan. 31st deadline for Rooney funding. Prerequisites: Depend on the project—Math 239 in general, Math 337 for some. Biology courses are beneficial but not necessary.

**Biostatistics with Phil Byrne and a biology professor.** Develop and/or analyze statistical information of importance to a biologist. Notes: The student will need to develop a project with an appropriate biology professor; the deadline for Rooney funds is Jan. 31. Pre-requisites: depend on the project.

**Game Theory with Robert Campbell III.** Antonim is a game played with two players with coins on a strip of squares. A move moves a coin from one square to a smaller-numbered square. Only one coin to a square, except that square zero can have any number of coins. A complete analysis of the game exists for three coins, but not more. In this project we will find patterns in Antonim using four coins and develop a strategy for winning. Prerequisites: Math 241

**Algebra with Sunil Chetty.** Determine all groups which admit only cyclic quotients, both in the finite and infinite cases. This project will, at least, involve studying finite simple groups and the group extension problem. Prerequisites: Math 331

**Other Topics.** Contact a professor with whom you’d like to work, either with your own idea or ask her or him for suggestions.
APPLICATION FORM
DUE: February 18, 2013 electronically to Bret Benesh

NAME: ___________________________ e-mail: ___________________

YEAR: ________  Name of sponsoring professor: __________________________

Have your sponsoring professor e-mail Bret Benesh confirming this sponsoring.

Do you have a work study grant? ________

Do you wish to live at SJU? _________ OR _________ at CSB? _________

Do you wish to use the meal plan? _________

Please list any times in the summer where you would NOT be able to do research due to travel/events/etc.

Check this line to indicate your commitment that, if chosen for summer research, you will write a report and give a presentation on your research _________

For each mathematics course you have finished at CSB/SJU, list its number, professor and the grade you received:

List all mathematics courses you are currently enrolled in here:

Describe the project you wish to do. (If it is one of those described in the announcement, you may refer to that description. For your own proposal, consult with your sponsoring professor to develop a description.)

Describe why you would like to do this research.