TCU Math News Letter

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A mathematician's reputation rests on the number of bad proofs he has given.

-A. S. Besicovitch

TCU Mathematics Lectureship Talk on January 13

Professor Maxim Braverman from Northeastern University in Boston, Massachusetts will give the talk "Index Theory, Old and New" on Tuesday, January 13, 2004. He will talk about some of the important ideas behind the Atiyah-Singer theory along with recent developments, including index theory on open manifolds and manifolds with a group action.

The talk will begin at 4:00 p.m. in Tucker Technology Center 138. Refreshments will be served in TTC 300 at 3:30 p.m.

National Science Foundation Summer Research Opportunities for Undergraduates

Undergraduate mathematics majors who are interested in participating in one of the National Science Foundation Research Experiences in Mathematics for Undergraduates Sites in the summer of 2004 will need to begin the application process soon. Many have application deadlines in February, and the applications typically require letters of recommendation from professors. The sites are located at universities across the country, and three, at Rice University, Trinity University, and Texas A & M, are located in Texas. The program at Rice will focus on statistics.

In these projects, undergraduate students conduct mathematical research under faculty guidance. They generally run from six to eight weeks in length. The student participants receive a stipend, housing support, and sometimes travel support. The experience gained in these REU projects is particularly helpful for students considering graduate study in mathematics.

Undergraduates who are interested in learning more about or applying to one of the REU projects can find a list of NSF REU sites with web links to the individual programs at http://www.nsf.gov/home/crssprgm/reu/list_result.cfm?unitid=5044.

Summer Programs for Undergraduate Women in Mathematics

Programs for undergraduate women mathematics majors are being held in the summer of 2004 at Carlton College, George Washington University, and at the Institute for Advanced Study in Princeton. The intent of

the programs is to excite young women about mathematics and mathematical careers and to provide them with the tools they will need to succeed. The programs are especially beneficial to students who might be interested in pursuing a graduate degree in mathematics. Each of these programs pay travel, housing, and food expenses, and Carlton and George Washington University also pay a stipend.

The Carlton program is four-week program intended for women completing their freshmen or sophomore years. Details can be found at http://www.mathcs.carleton.edu/smp. The application deadline is February 23, 2004.

The program at George Washington University is a five-week program intended for women who are completing their junior year. Details about this program can be found at http://www.gwu.edu/~math/spwm. The application deadline is March 1, 2004. The program at the Advance Institute is a 10-day program for very advance undergraduates. Details about this programs can be found at http://www.math.ias.edu/womensprogram. The application deadline is March 1, 2004.

Solution to the November 2003 Problem of the Month

Problem: Show that the x-coordinate of the point of intersection of the tangent lines to a parabola $y = ax^2 + bx + c$ at the points (x_1, y_1) and (x_2, y_2) is always $(x_1 + x_2)/2$. (Due to Scott Nollet.)

Solution: The tangent lines have equations, for i=1, 2,

$$y - \left(ax_i^2 + bx_i + c\right) = \left(2ax_i + b\right)(x - x_i).$$
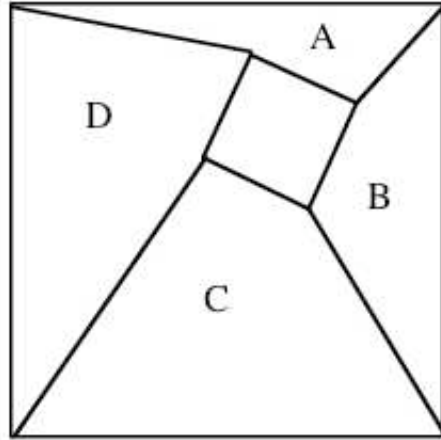
Equating y from the two equations yields

$$a\left(x_2^2 - x_1^2\right) + b\left(x_2 - x_1\right) = -2a\left(x_2 - x_1\right)x + b\left(x_2 - x_1\right) + 2a\left(x_2^2 - x_1^2\right).$$

Dividing by $x_2 - x_1 \neq 0$ and solving for x leads to the result.

This month's problem was solved by TCU undergraduate Kris Garrett and TCC undergraduate Mike Cestarte.

December 2003-January 2004 Problem of the Month

This month's problem is the latest Macalester College Problem of the Week, but apparently is about 10 years old and is due to V. Dubrosky. One square is inside another with corners connected to form four quadrilaterals with areas A, B, C, D as shown in the figure. Show that $A + C = B + D$.