TCU Math News Letter

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I sometimes ask myself how it came about that I was the one to develop the theory of relativity. The reason, I think, is that a normal adult never stops to think about problems of space and time. These are things which he has thought of as a child. But my intellectual development was retarded, as a result of which I began to wonder about space and time only when I had already grown up.

--- Albert Einstein

Editor: Dr. Rhonda Hatcher and Archive of Newsletters

Two Frank Stones Research Lectureship Talks in February

The Frank Stones Research Lectureship Series will feature two speakers in February. The first speaker, Professor Jerry Bona of the University of Texas at Austin, will present the talk "Solitary waves, singularities and the formation of sand bars" on Wednesday, February 10 at 4 p.m.

The second talk, "Geometric constructions of some irreducible unitary representations," will be presented by Professor Leticia Barchini of Oklahoma State University on Wednesday, February 24 at 4 p.m. Both talks will be given in Winton Scott Hall 145, and refreshments will be served in Winton Scott Hall 171 during the half-hour preceding each talk. All TCU students, faculty, and other interested members of the community are invited to attend the lectures.

Applications for NSF Research Experiences for Undergraduate Sites Now Being Accepted

The National Science Foundation Research Experiences for Undergraduate Sites for Summer 1999 have been announced. The sites will be at twenty-two different colleges across the United States A list of the sites along with the email addresses of the site coordinators can be found on the Internet.

Student participants at the REU Sites will be involved in research projects lasting from six to ten weeks in the summer of 1999. The research is done under the direction of faculty. Participants are paid a salary and possibly housing or travel allowances. In the summer of 1997, TCU undergraduate Aaron Heap was a student participant at the REU at Trinity University in San Antonio. He found it to be a very positive experience.

The REU experience is especially helpful to students who are considering going on to graduate work in mathematics, especially for those who would like to earn a Ph.D. The REU's give students experience with working on open-ended problems and a feel for what is involved in mathematical research at a higher level.

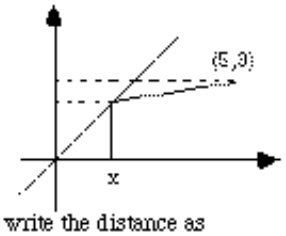
Any TCU undergraduate interested in applying for a student participant position at one of the 1999 Sites

should check the web site right away since many deadlines are quite soon. If you would like more general information about REUÕs you can come to discuss them with Professor Hatcher in Winton Scott Hall 142.

Solution to the December 1998 Problem of the Month

Problem: *What is the shortest possible total length of a path in the plane from the point* $(5,3)$ *to a point on the line* $y = x$ *and then to a point on the* x*-axis?*

Solution: The shortest distance is 5. The shortest distance from a point on the line $y = x$ to a point on the x-axis is obtained by dropping the perpendicular from the point to the axis.



The calculus solution is to write the distance as

$$f(x) = x + \sqrt{(5-x)^2 + (3-x)^2} = x + \sqrt{2x^2 - 16x + 34}\,.$$

Then

$$f'(x) = 1 + \frac{2x - 8}{\sqrt{2x^2 - 16x + 34}},$$

from which we find that the critical points of f satisfy $2x^2 - 16x + 34 = (-2x + 8)^2$. This equation has roots $x = 3$ and $x = 5$, but only $x = 3$ satisfies $f'(x) = 0$. It gives a minimum by the first derivative test.

We can avoid calculus by noting that the shortest total distance equals the shortest total distance from the point $(5,3)$ to a point on the line $y = x$ and then to a point on the y-axis. This total distance is just the distance from $(5,3)$ to the y-axis, or 5. The y-axis is the reflection of the x-axis in the line $y = x$. This technique is useful in many minimal distance problems; try problem A-2 on this year's Putnam, posted on the Problem Solving bulletin board.

Problem of the Month

You are blindfolded and face a large number of coins lying on a table. You cannot distinguish heads from tails in any way. You are told that 1999 of them are heads up. Show how you can divide the coins into two groups so that each group created has the same number of heads showing.

Students and others are invited to submit solutions to Dr. George Gilbert (Math Dept. Office or P.O. 298900). Correct solutions submitted by persons who are not members of the TCU math faculty will be acknowledged in the next issue of the newsletter. Note that a correct solution is an answer and a justification of its correctness. The solution to the problem will be published in the next edition of the newsletter.

The TCU Math Newsletter will be published each month during the academic year. Dr. Hatcher: Editor; Dr. Gilbert: Problem Editor; Dr. Doran: Thought of the Month Editor. Items which you would like to have included should be sent to Dr. Hatcher (Math Dept. Office or P.O. 298900).