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MERIT MATH MONTHLY

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Exam Dates

Math 120

-Exam #2
Wed. Oct. 6
-Exam #3
Fri. Oct. 29

Math 130

-Exam #2
Fri. Oct. 29

Math 242

-Exam #2
Fri. Oct. 29



**GOOD
LUCK ON
YOUR
EXAMS!!!!!!**

Once Upon a Time

History of the Merit Workshop

Roberto Caro and Suraj Prashad

In the late 1970's and early 1980's, graduate student Uri Treisman at the University of California-Berkeley, was working on the problem of high failure rates of minority students in undergraduate calculus courses. According to Treisman, the African-American calculus students at Berkeley "were valedictorians and leaders of church youth groups, individuals who were the pride of their communities. Thus these students had come to Berkeley highly motivated and under great pressure to succeed." Nevertheless, folklore blamed the high failure rates on the students' lack of motivation, lack of educational background, and lack of family emphasis on education. Treisman's work challenged these hypotheses, and replaced the remedial approaches with an honors program that encouraged students to collaborate on challenging problems in an environment of high expectations.

Treisman's mathematics workshop recruited mostly African-American and Latino students having relatively high SAT Mathematics scores or intending to major in a mathematics based field

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Someone to Remember

Tony Bedenikovic

Early Saturday morning on September 18, 1999, Javier Novella, a former Merit Workshop student, died of alcohol poisoning. Javier was a member of Math 120 Workshop in Fall 1996. "He was a fun-loving person who was on everyone's good side," recalled a workshop classmate. "He always had a smile on his face," added another. I remember him as a good, genuine person who was a valuable part of our class. While his death has served as a reminder of the danger of alcohol abuse, I choose to see his death as a reminder that sometimes good people leave too soon. Javier was 21.

Opinions... .

Brad Melahn

1. How did you hear about the Math Merit Workshop Program?
*"I heard about program from my student advisor during orientation."
-Matt Clover, freshman, Math 120*
2. What were your expectations of the class?
*"I thought it would be harder, but you get more out of it in the end."
-Brodie Bestrand, sophomore, Math130*
3. What do you think of the class so far?
*"It's kind of frustrating when the TA won't give you an answer."
-Kristin McCulloth, freshman, Math 120*

or both. Key elements of the workshop involved:

1. The focus on helping the minority students to excel at the university, rather than merely to avoid failure;
2. The emphasis on collaborative learning and the use of small-group teaching methods;
3. The faculty sponsorship, which has both nourished the program and enabled it to survive.

The Merit Workshop Program for Calculus was initiated at the University of Illinois (C-U) by Paul McCreary in the Fall of 1987. The purpose of the program was to address the issue of underrepresentation in mathematics and science based majors of minority students, students from small high schools, and females. Based on standardized test scores and chosen majors, students from these groups are invited each year to participate.

Currently, Merit Workshop classes meet for more hours per week than regular sections so that students can work collaboratively on intellectually challenging worksheets designed by the teaching assistants. The primary goal of the Merit Workshop Program is to keep students interacting with one another. Through developing strong interaction, the Merit Workshop seeks to put students in control of their learning by working on very challenging and difficult problems. Frustration levels become quite high; however, frustration does not evolve into a sense of demoralization and helplessness. The Merit Workshop provides an environment in which confusion and frustration are seen by students to be natural part of the learning process. In an ideal workshop setting, students discover they can overcome confusion through further work and communication.

The Merit Workshop Calculus Program at UIUC has proved so successful that it has expanded from first – semester calculus to subsequent calculus courses, including sections that use the computer – based Calculus & Mathematica. In addition to this dissemination within mathematics, the model has been experimented within other disciplines (e.g., chemistry) as well.

Problem of the Month

Lines and Planes in 3D

Manuel Gonzalez, Dan Podolner, and Elvira Torres

Almost all problems in Math 120 and Math 130 are in two dimensions, such as using graphs with the x- and y-axes. In Math 242, though, problems are given using three dimensional graphs as well. An example of a problem that involves three space is shown on the right.

Find the plane containing the two lines

$$L_1 = (1, 2, 1) + t(-1, -1, 1)$$

$$L_2 = (-1, 0, 1) + s(1, 1, 0)$$

The lines given are lines that exist in three dimensions. In order to find a plane two things are

required: a point on the plane, $P(x,y,z)$, and a vector \mathbf{n} that is perpendicular to the plane. The perpendicular vector \mathbf{n} is referred to as the normal vector.

To find the point P for the plane, find the point of intersection between the two lines. This can be done by setting their parametric equations equal to each other. The parametric equations are:

<u>Line 1</u>	<u>Line 2</u>
$x = 1-t$	$x = -1+s$
$y = 2-t$	$y = s$
$z = 1+t$	$z = 1$

So we must solve the equations

$1-t = -1+s$; $2-t = s$; $1+t = 1$; which gives $t=0$ and $s=2$, and putting them into the original parametric equations we find the point of intersection is $P(1, 2, 1)$.

In order to find the perpendicular vector \mathbf{n} for the plane, we use the cross product. The cross product is a tool used to take two vectors and find a vector perpendicular to them. In this case, we get the two vectors from the lines L_1 and L_2 . They are $\mathbf{a} = \langle -1, -1, 1 \rangle$ (for L_1) and $\mathbf{b} = \langle 1, 1, 0 \rangle$ (for L_2). The cross product is computed by taking the determinant of this matrix:

$$\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ -1 & -1 & 1 \\ 1 & 1 & 0 \end{vmatrix}$$

which is $(0-1)\mathbf{i} - (0-1)\mathbf{j} + (-1-(-1))\mathbf{k} = -\mathbf{i} + \mathbf{j}$. So $\mathbf{n} = \langle -1, 1, 0 \rangle$.

Since a point P on the plane and a vector perpendicular to the plane have been found, an equation of the plane can be found using $a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$ where

$\mathbf{n} = (a, b, c)$ is the orthogonal vector and x_0, y_0, z_0 are the components of the point $P(x_0, y_0, z_0)$ on the plane. This results in the equation

$$-(x-1) + (y-2) = 0.$$

This type of problem has most of its overlap with the material in 120 with the equation of a line in three-dimensional space. The equation of a line in two-space is $y = mx + b$ while in three space it is $\mathbf{r} = \mathbf{tv} + \mathbf{r}_0$. The vector \mathbf{v} used in three-space is likened to the slope m of a line in two space (since it gives the direction of the line). Also, the point \mathbf{r}_0 is similar to the y – intercept b of a line in two-space (since they each give location of the line with a certain direction). This problem and its ideas can be studied using Mathematica, which the 130 students will be using and have practice with.

