

Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium

Number 2, November 1996

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[1] **Wanted!!! Reward!!!**

Laurette Foster
Prairie View A & M University

Prairie View A & M University hosted a *Calculus Reform Workshop*. This workshop made an impact by changing the ideas toward technology for many. The participants were high school teachers from various school districts, community colleges and universities. The participants were involved in three days of information, dissemination, and hands on participation related to technology. As the participants moved throughout the building,

they triggered an interest from those undergraduate students that were attending classes in that facility. At the end of the workshop we were fortunate enough to secure additional TI-82 graphing calculators.

The announcement read WANTED!!! and REWARD!!!. Wanted were mathematics majors and minors who were seeking reform in learning mathematics. For some, reform meant the initiation of technology. For others, it meant improving and increasing their usage of technology as they learned mathematics.

When the signs went up the students called and stopped by to register for the sessions. The contract stated the participants were required to attend eight one hour sessions as well as prepare one group report. The reward was one TI-82 calculator. Eight students and two faculty members were registered. We met for one hour each week for eight weeks. After the second week there were additional students and faculty who registered just to improve their skills. Working in groups of two's the participants proceeded through each of the commands given in the manual. At the end of each session (which often lasted beyond the one hour allotted) the participants were given a problem from a previous workshop instructed by professors Don Small and Willie Taylor to work on in small groups. The problem was to be returned at the next session.

Just observing the collaborative learning was

exciting and challenging. Each of their *REWARDS* was truly earned. Many of the participants continue to come by and share the progress of their education. There are others who come by to inquire of the next session because of the information they've obtained from their peers.

To say the least, the impact and extension of the initial *CALCULUS REFORM WORKSHOP* went far beyond its registered participants and has been a *REWARD* for all participants.

[2] Vignette - Dr. Walter Massey

Dr. Walter Massey is one of the most gifted and talented scientist and educator that America has produced. His accomplishments are quite extraordinary. He was born and raised in Hattiesburg, MS. After graduating from Morehouse College, he earned the M.A. and Ph.D. Degrees in Physics from Washington University in St. Louis, MO.

Among his many outstanding accomplishments, Dr. Massey has served as: Dean of Brown University; Director of the prestigious Argonne National Laboratory; Vice President for both Research and the Argonne National Laboratory at the University of Chicago; and President of the American Association for the Advancement of Science.

In 1992, President George Bush named Dr. Massey Director of the National Science Foundation, a position that he held until 1993 when he accepted the position of Provost and Senior Vice President for Academic Affairs for the University of California System. In 1995, Dr. Massey was appointed the ninth President of Morehouse College, his Alma Mater.

“Embrace the opportunity that education presents, the privilege you have worked so hard to earn and to which so many others have contributed - your mothers, fathers, guardians, friends, teachers, classmates, and others. Don't jeopardize your future. Don't compromise your commitment to others.”

Dr. Walter Massey

[3] Question: “Build High or Build Wide?”

Jed decides to build a greenhouse along an 18 foot wall of his house. The cross sectional shape is to be triangular. Having been given several 10 and 12 foot timbers that he can use as floor joists or uprights, Jed decides to construct his greenhouse 10 feet wide and 12 feet high or 12 feet wide and 10 feet high. A practical consideration is that usable space must be at least 4 feet high and no higher than 10 feet. Jed's dilemma, and your question is, should he build 10 feet wide and 12 feet high or 12 feet wide and 10 feet high in order to maximize the usable space? Explain your reasoning.

Hint: Draw cross sectional diagrams of the two possibilities and indicate the usable space on your diagrams.

[4] 5 Minute Writing Assignment

**Eugene Taylor
Grambling State University**

In my Calculus I class, I had spent 3 class periods on limits before giving this writing assignment. Therefore, I had dealt with the intuitive idea of a limit as well as some computational techniques. I began the fourth class with the following 5 minute assignment.

WRITING ASSIGNMENT

Explain in words what is meant by the expression:

$$\lim_{x \rightarrow 2^+} \frac{x + 1}{x - 1} = 3$$

I have 56 students in this class and on that day 51 were present and took the writing assignment. Only 30 students responded correctly.

One wrong response stated that when

$$x = 2^+, \frac{x + 1}{x - 1} = 3$$

A correct response read as

“As the values of x get closer and closer to 2 from the right side of 2, values of $\frac{x+1}{x-1}$ get closer and closer to 3.”

The second student clearly understands the concept better.

I believe that giving our students writing assignments such as those above will cause the students to think about the concepts more as opposed to looking for a quick formula all the time.

[5] Activity: Perfect Numbers

(This is a small group, in-class activity that involves determining the divisors of a positive integer. Each group of students should have at least one calculator.)

A positive integer is a perfect number if it is equal to the sum of its proper divisors. For example, 6 is a perfect number because integers 1, 2, and 3 are the proper divisors of 6 and $1+2+3 = 6$. Is the integer 1 a perfect number? Why?

Determine a perfect number different from 6.

[6] Activity: Slide for Life

(This is a class activity that engages the students in a “discovery” exercise.) The purpose of this activity is twofold. First is to give students the experience of the discovery process of: making a conjecture (e.g., informed guess), noting the error, then revising the conjecture based on an analysis of the error. The second purpose is to provide students with a fun exercise that will help them understand the roles of slope and y -intercept in the equation of a line. (This activity requires a calculator and a viewscreen.)

In Army Ranger training, recruits are required to perform a Slide for Life. A long cable is stretched taut from a high point to a low point usually over a river or a ravine. The recruit grabs a hook attached to a pulley that rides along the cable from the high end to the low end. The recruit, hanging onto the hook, hurdles down the cable and lets go of the hook just before the low end point of the cable is reached.

General Colin Powell writes in his book “My American Journey” about his Slide for Life experience. He says

I can remember the moment I had my first doubt about the career I had chosen. It happened in the mountains of northern Georgia as I hurtled along a cable at the height of one hundred feet, seconds from being smashed against a huge tree. This exercise was called the Slide for Life, and the Army was making me perform it to see if I was scared. I was.

Consider the graph of

$$f(x) = -x^4 + 4x^3 + 3x^2 - 18x + 8$$

to represent a portion of the skyline in the mountains of northern Georgia.

The Slide for Life cable is to run from the highest peak to the lowest peak. In order to determine factors such as distance, speed, “fear,” etc., it is necessary to know the equation of the line formed by the cable. That is, the line that is tangent to the two peaks.

Problem: Determine the equation of an acceptable approximation of the line that is tangent to the two peaks.

(The instructor needs to determine what constitutes an acceptable approximation. In one class, “eyeball” tangency may be enough in another class, eyeball tangency after zooming maybe required.)

Suggestion for implementing this activity: Plot the graph of $y = f(x)$ and project it onto a large screen in front of the class. Explain the problem and ask for someone to guess the equation of the desired tangent line. Write the guess on the chalk board and then superimpose the graph of it on the plot of

$y = f(x)$. If the guess is not “correct,” ask the students how the equation should be modified. Copy the modified form of the equation on the board and then superimpose the graph of it on the previous plot. Iterate this procedure until an acceptable equation is obtained. (Expect that the original guess will need to be modified several times.)

A follow-up activity would be to divide the class into small groups and have each group develop a similar situation with a different function. Then have pairs of groups challenge each other to do the problem that they had developed.

[7] **Notes**

1. We will not publish a December Newsletter.

The Deadline for contributions to our January Newsletter is

- (a) Wednesday, January 15, 1997.

Opinion articles, suggestions for writing assignments, small group in-class activities, small group out of class projects, Quick Questions, CBL activities, announcements, etc. are all welcomed. Please send material to Della Bell, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.

2. Joint Mathematics Meetings in San Diego, 7-11 January 1997. Particular sessions of interest:

- a. Thursday, 7-8:30 PM: Calculus Reform Workshop Participants Reunion;
- b. Friday: 1-3:00 PM: HBCU College Algebra Reform Local Coordinators meeting;
- c. Friday 7-9:00 PM *CRAFTY* Panel on College Algebra Reform
Panelists: Della Bell (Texas Southern Univ.), President Hicks (Grambling State Univ.), Linda Kime (Univ. of Mass. at

Boston), Benny Evans (Oklahoma State Univ.); Moderator Don Small (U.S. Military Academy);

- d. Saturday morning: NAM panel on Calculus Reform

Panelists: Della Bell (Texas Southern Univ.), Lawrence Woodard (Grambling State Univ.), Don Small (U.S. Military Academy); Moderator Jackie Giles (Central College of the Houston Community College System).

[7] **Acknowledgments**

A special thanks to Mrs. Jackie Gile’s (Houston Community College Central Campus) and the students in her 11:30 AM College Algebra class for submission of solutions to the problems and questions posed in the First Edition of the HBCU College Algebra Reform Consortium Newsletter. In particular, thanks to Andrea Teany Thompson calling attention to errors in three of the equations for the “Happy Face.” The corrections are as follows

$$y_5 = k + \sqrt{r_2^2 - (x + h)^2}$$

$$y_6 = k - \sqrt{r_2^2 - (x + h)^2}$$

$$y_7 = -c - \sqrt{h - x^2}$$

Keep up the good work.

Reflections

As the Thanksgiving Day approaches, we reflect on the many reasons we have to be thankful. This season we have several things to add to this list including the beginning of the HBCU College Algebra Reform Consortium and the publication and distribution of the first two Newsletters. We are grateful for work which adds meaning to our lives, our students, colleagues, and the opportunity to “serve” and contribute to the mathematics education of our young people. Thank you for sharing and caring. Have a Merry Christmas and a Happy New Year.

Della Bell