Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

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[1] A Salute to General & Lavon Marshall

Dorothy Hunter
Huston-Tillotson College

The close of this semester will be the close of a 35-year era of participation in the education of students at Huston-Tillotson College (HTC) by the Marshall Dynamic Duo. Dr. General G. Marshall and his wife Mrs. M. Lavon Marshall will retire at the close of this academic year.

Higher education in general, and our college in particular, will feel the void left by the retiring of these two outstanding educators. The administrators, faculty, staff, and students who have worked with them over the years have a deep appreciation for the contributions made by the Marshalls to their individual lives and the life of the college.

Prior to his career at HTC, Dr. Marshall was awarded Teacher of the Year, School, County, and Region in 1963 in Statesboro, Georgia for his high teaching performance at William James High School where he taught mathematics from 1957 to 1966 and served as Department Chair. At HTC he was awarded the Teaching Excellence Award in 1992 and 2000. In addition to his varied teaching duties at the college, Dr. Marshall serves as Chair of the Department of Physical Sciences and the Division of Natural Sciences. He is also Coordinator of the Alliance for Minority Participation in Science (AMP), and the HTC College Algebra and Calculus Reform Programs; and Director for the Austin Pre-freshmen Engineering (AusPREP), and Eisenhower Grant Programs.

* Supported by the EXXON Education Foundation and the U.S. Military Academy.

Mrs. Marshall also worked at William James High School in Statesboro prior to coming to Huston-Tillotson. From 1966 to the present, Mrs. Marshall served as Director of Alumni Affairs, Career Counseling and Placement, and Human Development; Dean of Students; and Vice President of Student Affairs. Her college activities include service on the campus Administrative, Educational Policy, and Judicial Councils; and on the Inter-collegiate Athletic and Academic Honors and Awards Committees. She also serves as advisor for the senior class and coordinator of standardized testing.

Dr. Marshall received his AB from Morehouse College, his MA from UT Austin, and his Ed.D. from the University of Houston. Ms. Marshall received her BA from Huston-Tillotson College, her M. Ed. from UT Austin, and did additional study at UT and Texas Tech University. She is a licensed professional counselor.

They both participate in numerous professional organizations affiliated with their educational and community service goals. He is a member of Alpha Phi Alpha Fraternity, Inc. and she is a member of Zeta Phi Beta Sorority, Inc. They are active members of Ebenezer Baptist Church.

The Marshalls have three children who recognize the value of the example set by their parents. Geoffrey T. Marshall holds an MBA and is currently employed by Proctor and Gamble in Cincinnati, Ohio; Karen L. Clark holds an MBA and is currently employed by Nortel in Mesquite, Texas; and Tanya M. Moore is a CPA and an entrepreneur for H&R Block in Humble, Texas.

General and Lavon are now the proud and doting grandparents of 7 children. Kristen Marie and Kaitlyn Ann are the children of Geoffrey and wife, Rhonda (a pharmacist); Brandon Royce and Ashley Lavon are the children of Karen and husband Billy R. (high school coach); and Prentice Lance, Taleah Therese, and Worthington G. are the children of Tanya and husband Shelvin L. (computer consultant).

Their contributions to education in general and to the education of young people in particular are tremendous. Though General will now have time to pursue two things that he loves, photography and golf (and he excels at these also), and Lavon will now be able to enjoys her pursuits, we can rest assured that they will continue to make contributions to the education of young people.

[2] Modeling Wastewater Flow

The town of Fruita, Colorado is planning on building a new wastewater treatment plant. The town can afford to build a plant that will meet the requirements for a population of between 6500 people and 8600 people. The wide range is based on the average daily water usage in the United States of between 150 and 200 gallons per day per person.

Fruita's Wastewater Planning Commission provides the following background and then poses several questions/tasks. Wastewater does not flow into a municipal wastewater treatment plant at a constant rate. The flow varies throughout the day, reflecting the daily water-use patterns of the area served. On the other hand, a wastewater treatment plant works best when designed to handle a constant rate of flow into the treatment plant. A solution to this dilemma is the construction of a Flow Equalization Basin (FEB). An FEB is a tank designed to collect and store wastewater. The wastewater is then pumped from the FEB into the treatment plant at a constant rate. The level of wastewater in the FEB will vary throughout the day, but should remain constant from day to day.

That is, the level at ten o'clock one day should be the same at ten o'clock on the following day.

Table 1: Wastewater flow from the town of Fruita into an FEB, taken at six-hour intervals on a random day.

$Hour$	$Flow(m^3/min)$
$Midnight$	$2,502$
$6AM$	1.368
$Noon$	4.360
$6PM$	5.178
$Midnight$	2.502

Table 2: Recent population data for the town of Fruita.

$Year$	$Population$
1996	4411
1997	4542
1999	4804

Questions/Tasks:

a. Why is it important that the level of wastewater in the FEB remain constant from day to day?

b. Identify some of the characteristics you would expect of a model of the wastewater flow into the FEB as a function of the time of day.

c. Plot the flow rate data in Table 1.

d. Model the long term wastewater flow that fits the data in Table 1.

e. Using your model, determine the flow out of the FEB into the treatment plant so that the level of waste water in the FEB remains constant from day to day.

f. Approximate the volume of the FEB. Explain your reasoning.

g. If the town of Fruita is expected to grow at a rate proportional to the population, how many years will this new plant meet the demands of the town? Explain your reasoning.

[3] The Equal Symbol, One Among Many

What would algebra be without equations? And, How could there be equations without an equal sign? From earliest recorded times there are accounts of dividing lands among tribes or estates among heirs. These are instances of the total being equal to the sum of its parts. Thus it is a bit surprising that a symbol for equality was not firmly established until the late 1500s. David Bodanis, in his book $E = mc^2$ published by Walker and Co, New York, describes (p. 25) the competing choices of equality symbols in the mid 1500s. To denote the equation that y equals x^2, one could have written

$y \mid\mid x^2$
$y \longrightarrow x^2$
y .aequs. x^2
$y \,][\, x^2$
$y =\!=\!=\!=\!=\!=\!=\!= x^2$

The last symbol was introduced in the 1550s by the Englishman Robert Recorde with the explanation "... And to avoid the tediouse repetition of these woordes: is equalle to I will sette ... a pair of parallels, or ... lines of one lengthe, thus: ======== because noe .2. thynges, can be more equalle ..."

[4.] Parametric Equations Describe Curves

Tong Wu
Texas Southern University

The natural world is filled with curves: some satisfy the vertical line test, others do not such as a pretzel shaped curve; some are closed and bounded such as a loop, others are open and unbounded such as a spiral emanating from a point; some lie in a plane, others in three dimensional space such as the path of a space vehicle or the track of a roller coaster. There are several different ways of representing curves in mathematics that enable one to understand the curves and to appreciate their beauty. We often describe a curve in a plane that passes the vertical line test as the graph of a function. However for curves that do not pass the vertical line test (think of a circle or a space curve),

we turn to parametric equations for their descriptions. Computer generated figures are obtained by combining individual curve segments defined parametrically as illustrated in the following activity.

Definition: Let C be the curve in the plane consisting of all ordered pairs $(f(t), g(t))$ where f and g are continuous on the interval I. The equations $x = f(t)$ and $y = g(t)$ are called parametric equations for C with parameter t.
(Query: How would you generalize the previous definition to a space curve in three dimensions?)

Activity: Learning to Use Parametric Equations to Create a Picture.
a. Understand that there are infinitely many different parametric representations for a given curve.

i. Construct a set of parametric equations different from the following two examples whose graph is the horizontal line segment $\{(x, y) : -4 \leq x \leq 4, y = 1\}$.
Example 1. $C1: \ x = 4\cos(t), y = 1$ for $t\epsilon[0, \pi]$
Example 2. $C2: \ x = t, y = 1$ for $t\epsilon[-4, 4]$

ii. Construct a set of parametric equations different from the following two examples whose graph is the vertical line segment $\{(x, y) : x = 3, 2 \leq y \leq 6\}$.
Example 1. $C1: \ x = 3, y = t$ for $t\epsilon[2, 6]$
Example 2. $C2 \ x = 3, y = 2\cos(t)+4$ for $t\epsilon[0, \pi]$

b. Construct three parametric sets of equations, different from the following example, whose graphs form a triangle with vertices (3,2), (3,6), (5,3).
Example: $C1: \ x = 3, y = 2\cos(t) + 4$ for $t\epsilon[0, \pi]$
$C2: \ x = \cos(t) + 4, y = 0.5\cos(t) + 2.5$ for $t\epsilon[0, \pi]$
$C3: \ x = \cos(t)+4, y = -1.5\cos(t)+4.5$ for $t\epsilon[0, \pi]$

c. Construct sets of parametric equations whose graphs give the following picture.

Notices

1. The National Visiting Committee (NSF) for the HBCU Consortium for College Algebra Reform will meet April 27-28, 2001.

2. A writing Workshop for the HBCU Consortium for College Algebra Reform will meet April 28, 2001 at Texas Southern University.

3. Alex Fluellen and Laurette Foster will conduct a Contemporary College Algebra dissemination workshop at Tuskagee University, May 13-16, 2001. Contact Herman Windham (334-727-8556/8564).

4. Della Bell and Don Small will conduct a Contemporary College Algebra dissemination workshop at Miami Dade Community College, May 30-June 2, 2001. Contact Norma Agras (334-727-8556/8564).

5. Sarah Bush and Don Small will conduct a Faculty Development Workshop for Tribal College faculty, June 7-9, 2001.

6. Laurette Foster and Dorothy Hunter will present a mini-course on Contemporary College Algebra at the Math Fest at the Univ. of Wisconsin, August 1-3, 2001.

7. The Third Edition of the *Contemporary College Algebra* text is available from Glencoe Sales Division/McGraw-Hill, Woodland Hills, California 91367 (call 1-800-423-9534). A Teacher's Guide can be obtained from Don Small (don-small@usma.edu).

8. The next issue of the *Vision - Potential* Newsletter will appear in September 2001. The Deadline for contributions to the September Newsletter is Monday, September 3, 2001

9. To subscribe to this Newsletter or to submit articles, write to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.