

# Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium\*

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[www.ContemporaryCollegeAlgebra.org](http://www.ContemporaryCollegeAlgebra.org)

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**Notice!!!** Starting with the September issue, the *Vision-Potential* Newsletter will only be distributed electronically. In order to continue receiving the Newsletter, send your request and your e-mail address to Don Small, [don-small@usma.edu](mailto:don-small@usma.edu). Past issues of the Newsletter are available on the website: [www.ContemporaryCollegeAlgebra.org](http://www.ContemporaryCollegeAlgebra.org).  
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## [1] Lines, Distances, and Circles

Computing equations of lines and distances are basic skills for college algebra students. The definition of a circle depends on the distance formula as it states: A circle is the set of points in the plane that are a fixed distance from a fixed point, called the center. The fixed distance is called the radius of the circle. Query: Explain why  $(x - h)^2 + (y - k)^2 = r^2$  is the formula of a circle with center at  $(h, k)$  and radius  $r$ . The following exercises can be used for in-class, small group activities.

\* Supported by the U.S. Military Academy.

- a. Determine the equation of the line that passes through the points  $(1,2)$  and  $(4,-5)$ .
- b. Determine the equation of the line that passes through the point  $(3,4)$  and has a slope of 2.
- c. Determine the distance between the points  $(2,3)$  and  $(4,5)$ .
- d. Determine the equation of the circle lying in the first quadrant with center at the point  $(2,5)$  that passes through the origin.
- e. Determine the equation of the circle whose center is at the intersection of the lines:  $2x + 3y = 2$  and  $x - y = 5$  with a radius of 6.
- f. Determine the equation of the largest circle in the first quadrant whose center is at the intersection of the lines:  $x - 3y = 4$  and  $x - 2y = 5$ .

## [2] HBCU Retreat and Follow-On Program

As reported in the February 2006 issue of the *Vision-Potential* Newsletter, the National Science Foundation (NSF) and the Army Research Office (ARO) have funded this new program to assist eleven HBCUs to refocus their college algebra or calculus programs. The program is administered by the U.S. Military Academy. The goals of this three-year

program are to: (1) Provide a structured opportunity for eleven HBCUs to reform their college algebra or calculus curriculum and (2) Develop and pilot test reform programs.

This spring, six HBCUs were selected to participate in a curriculum retreat at the U.S. Military Academy (USMA). During the retreat, each school team, assisted by a mentor, will finalize a reform plan suitable to their school and develop an implementation strategy. The “Follow-On” portion of the program will consist of the mentors making two site visits to each school and team members making presentations at the Joint Mathematics Meetings. A second cohort of five HBCUs will be selected in the spring of 2007.

COL Kathleen Snook (ret), the outside evaluator for the program, will conduct a research study on the effectiveness of refocusing college algebra.

The schools, team members, and mentors selected for the 2006 cohort are:

1. Albany State University
  - a. Dr. Zephyrinus Okonkwo
  - b. Mrs. Connie Leggett
  - c. Mr. Jerome MyricksMentor: Dr. Dennis Davenport
2. Florida Memorial University
  - a. Dr. Thelma Lawton
  - b. Dr. Carlos Canas
  - c. Dr. Abbas ZadeganMentor: LTC Archie Wilmer
3. Fort Valley State University
  - a. Dr. Josephine Davis
  - b. Mr. Gholamreza Keihany
  - c. Dr. Alvina AtkinsonMentor: MAJ Tony Johnson
4. Howard University
  - a. Dr. Jill McGowan
  - b. Dr. David James
  - c. Dr. Paul BezandryMentor: MAJ Donald Outing

5. Savannah State University
  - a. Dr. Mulatu Lemma
  - b. Dr. Jonathan Lambright
  - c. Dr. Hyoun Kyun OhMentor: Dr. Don Small
6. Virginia State University
  - a. Dr. Cheryl Adeyemi
  - b. Dr. Diana Perdue
  - c. Dr. Gerald BurtonMentor: Dr. Laurette Foster

Applications are being accepted for next spring’s (2007) cohort. Contact Don Small at don-small@usma.edu.

### **[3] Comprehending the Size of the National Debt**

Last month the government announced that the National Debt had reached \$8.3 trillion. How does one comprehend the size of 8.3 trillion? Saying it is 83 followed by eleven zeros is not meaningful to most people.

- a. If \$8.3 trillion was stacked up in \$1,000 bills, how high (in miles) would the stack reach? How would the height of the stack compare to the distance from your school to London, England?
- b. How much is the National Debt on a per capita basis?
- c. If the U.S. Government financed the debt at 5% APR, how much would the interest be this year?
- d. The National Debt was \$5.7 trillion in 2000. Assuming the debt grows at a constant rate, when would it reach \$10 trillion?

(The Durst Organizations displays a National Debt Clock on an electronic billboard in New York City. At present, the billboard is not large enough to accommodate the extra digit

that will be needed when the debt reaches \$10 trillion.)

**[4] Test over Sections 3.4 and 3.5**

Yvette Stepanian  
Virginia Commonwealth University

This test, covering Sections 3.4 and 3.5 in the Contemporary College Algebra text, was given at Virginia Commonwealth University.

**1.** (24 points) The following graph represents China's trade (in billions of dollars) with the United States since 1994.

- Estimate the U.S. export in 1996.
- Estimate  $f(6)$  and write a sentence that explains its meaning.
- What is the domain and range of this function, if we consider only the indicated points?
- Give the percent increase of the U.S. exports between 1996 and 2000. Show work.
- According to the graph, when did the U.S. export 17 billion to China?
- Estimate  $f^{-1}(25)$ . Write a sentence explaining its meaning.

**2.** (6 points) Given  $f(x) = 5 - x^2$ , give the expression of  $f(x + 2)$ . Simplify your answer.

**3.** (12 points) The following graph shows the graph of F, fixed cost function for manufacturing pieces of medical equipment, and the graph of V, variable cost for manufacturing the same pieces of equipment.

- Using these graphs sketch the graph of the Total Cost (Total Cost = Fixed Cost + Variable Cost). You must clearly label a few points.
- For how many units manufactured does

the Total Cost reach \$900,000?

**4.** (8 points) Find the inverse of  $g(x) = \ln(x + 1) - 5$ . Show your work.

**5.** (12 points) Consider the functions  $f(x) = \frac{x}{6} + 1$ ,  $g(x) = \frac{5x}{6}$ ,  $h(x) = \log(6x + 5)$ . Find:

- $(f + g)(x) = f(x) + g(x) =$
- $(h \circ g)(x) = h(g(x)) =$

**6.** (8 points) Solve the following algebraically. Show your work.

$$\log(x + 2) - \log(3 - x) = 1$$

**7.** (10 points) Determine, with reason, if each of the following represents a one-to-one function (an invertible function):

a.

<b>x</b>	-3	4	0	3	1	2
<b>f(x)</b>	3	0	9	8	7	4

b. The function that assigns to each of the 40 students of a class (input variable), their number of siblings (output variable).

**8.** (20 points) The table below shows data on the indicated years for the number of U.S. air carrier accidents, for all military services. Plot the data in a scatter plot, with  $x = 0$  representing the year 1970, and then answer the questions.

<b>Year</b>	'75	'80	'85	'90	'95	'00
<b>Accidents</b>	47	34	27	22	25	37

- The smallest number of accidents occurs in 1990. Using this information, write the expression of a quadratic function  $y = a(x - b)^2 + c$  that best approximates the data.
- Explain clearly your choice for the value  $b$ , as well as the sign of  $b$ .
- Explain clearly your choice for the value  $c$ , as well as the sign of  $c$ .
- Explain clearly your choice for the value  $a$  (explain why the value is

- smaller or bigger than 1), as well as the sign for  $a$ .
- e. How many accidents does your model (in a) predict for 1987?
  - f. Using ALGEBRA and your model from a, when should the number of accidents be 35?

[5] **Notices**

1. Laurette Foster (Prairie View A&M Univ.) and Alex Fluellen (Clark Atlanta Univ.) will conduct a minicourse on Contemporary College Algebra at the 2006 *Mathfest*, Knoxville, TN, August 12-13, 2006.
2. MAA PREP Workshop on *Refocusing College Algebra*, May 22-25, 2006 at Florida Gulf Coast Univ. The workshop facilitators are:  
Don Small (US Military Academy), Norma Agras (Miami Dade College), and Yvette Stepanian (Virginia Commonwealth Univ.). For information, contact Norma Agras at nagras@mdc.edu.
3. Connecticut Community College Workshop on Refocusing College Algebra, May 31 - June 2, 2006 sponsored by Gateway Community College, North Haven, CT. Contact Miguel Garcia: MGarcia@gwcc.comnet.edu.
4. HBCU Retreat, June 5-8, 2006, US Military Academy, West Point, NY. Contact Don Small: don-small@usma.edu
5. Deadline for contributions to the September Newsletter is Friday, September 1, 2006. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.
6. To subscribe to this Newsletter, send your e-mail address to Don Small, Department of Mathematics, U.S. Military Academy, West Point, NY 10996 or contact him via e-mail at don-small@usma.edu.

“There is nothing that is a more certain sign of insanity than to do the same thing over and over and expect the results to be different.” Albert Einstein

“Not everything that counts can be counted, and not everything that can be counted counts.” Albert Einstein

“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.” Albert Einstein