

Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

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[1] **Employer Panel: “New Hires”** **Pam Wells & Char Beckman** **Grand Valley State University, MI**

The Career Services office at Grand Valley State University sponsored a “Science and Mathematics Employer Panel” on November 29, 1995. The panel consisted of actuaries, microbiologists, geologists, engineers, and chemists from such companies as Amway, Auto Owner’s Insurance, Earthtech, and the Michigan Department of Natural Resources. Following is a report of the information presented.

The panelists spoke on what their companies looked for in new hires.

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

A. Panel members agreed that they prefer to hire persons with broad science/math backgrounds (for example, a geologist with a chemistry background, a biochemist with a math background, a mathematician with a computer science background, or any science with a business or management background) over a person with a single specialty.

B. Employees need to be able to think critically in the real world.

- a. At least part of their education should require students to design and carry out their own research. Students with research experience were highly valued because of their experience communicating their work orally and in writing.
- b. Potential employees who had completed internships also were valued highly because such persons had a sense of direction for what they want to do for the next few years.

C. The most important factor in getting and keeping a job were good communication skills and good interpersonal skills.

- a. Employees must be able to interact with persons with different points of view and different technical backgrounds.

- b. Employees must be able to communicate with the public (who provide money through taxes or purchases).
- c. Employees need to work well in teams and be able to present their technical knowledge both orally and in writing in a way that lay people can understand.

D. New hires need good computer skills, including but not limited to:

- a. facility with word-processing, data base, and spread sheet applications;
- b. ability to access remote computers to search out and use information pertinent to the problem under study; and
- c. ability to learn and use software applications specific to an employee's field.

Specifically with regard to mathematics majors, the two actuaries on the panel gave some insights into what they like to see in people they interview. They prefer a math major with a minor in computer science or a CS major with a minor in mathematics. Again they stressed good communication skills and the need to be analytical and creative. In fact, one of the actuaries liked to see a music background since that could indicate that the person is comfortable in front of a group. Having taken and passed the first two actuarial exams is also a plus.

[2] Class Activity: An Aging Population

(This is a small, in-class group project. Each group needs to have a graphing calculator. Class time should be reserved for group reports.)

Whether you view the aging population in terms of gaining a more experienced population or of seeing a greater abundance of gray hairs, everyone can agree that the percentage of the population that

is over 65 is growing exponentially. The February 1997 issue of *Academic Leader* (Newsletter for Deans and Department Chairs) gave the following predictions on the size of the population of persons over 65.

Years	<i>Population(millions)</i>
1900	3.1
1992	32.3
2000	35.3
2010	40.1
2020	53.3
2030	70.2

Your tasks are to:

- a. Plot the data points.
- b. Fit a curve to the points.
- c. Predict the population of persons over 65 in the year 2050.

The data points indicate that the “over 65” population is growing exponentially. Assume that the exponential model is of the form $f(x) = cb^x$. For the second task, use the “trial-and-improve” method to experimentally determine suitable values of c and b such that the graph of $f(x) = cb^x$ provides a good fit of the data. The trial-and-improve method consists of making a guess for the values of c and b , plotting the resulting function, and observing how well the plot fits the data. Then revise your guesses of c and b in order to get a “better fit.” Continue this process of making successive approximations until a suitable fit has been obtained. Keep a record of your approximations.

Your final task is to report to the class on two things.

1. How you formed your successive approximations (explain your reasoning for how you revised your guesses for the values of c and b) and what you mean by a “suitable fit.”

2. Give three reasons why it is important to project the size of the over 65 population.
- [4] **Writing Assignment: “Inverse Functions”**

Some functions have inverses and some don't. How do you tell? If a function has an inverse how can you determine the inverse? How can you sketch the graph of the inverse?

Write a short essay describing:

- What properties a function must have in order to have an inverse.
- How to find the inverse of a function.
- Why the reflection of the graph of the function in the line $y = x$ is the graph of the inverse.
- Illustrate with a linear function, a quadratic function, and an exponential function.

[3] **Small Group Activity: Sales Tax Table**

(A small, in-class group calculator exercise.)

Situation:

Your State has just adopted a progressive Sales Tax. The tax rate is 7.5% on dollar amounts. For amounts less than one dollar, the rate begins at 2% (on a purchase of zero cents) and increases linearly to 7.5% (on a purchase of 100 cents).

The group task is to fill in the Purchase column in the following table and then sketch the graph of the Sales Tax function. (Note: The entry in the Purchase column corresponding to the 2 in the Sales Tax column is the range of purchase values whose tax is two cents.) Let the vertical axis represent the amount of Sales Tax (in cents) and the horizontal axis represent the amount of purchase from 0 to 100 cents.

<u>Purchase (cents)</u>	<u>Tax (cents)</u>
	0
	1
	2
	3
	4
	5
	6
	7

Explain your reasoning process in completing the preceding table.

How much Sales Tax would you pay on a purchase of \$3.87?

How much Sales Tax would you pay on a purchase of \$4.43?

[5] **History: How Old was Diophantus?**

Diophantus of Alexandria is thought to have lived in the third century. Not very much is known about Diophantus's life, except for an epigram given in the *Greek Anthology* which contained the following

Diophantus passed one sixth of his life in childhood, one twelfth in youth, and one seventh more as a bachelor. Five years after his marriage was born a son who died four years before his father, at half his father's (final) age.

How old was Diophantus when he died?

Now for a bit of math history.

Noted mathematical historian Howard Eves wrote on p. 147 in his text, *An Introduction to the History of Mathematics*, 4th Ed., Holt, Rinehart, and Winston,

In 1842, G. H. F. Nesselmann conveniently characterized three stages in the historical development of algebraic notation. First, we have rhetorical algebra, in which the solution of a problem is written, without abbreviations or symbols, as a prose argument. Then comes syncopated algebra, in which abbreviations are adopted for some of the more frequently recurring quantities and operations. Finally, at the last stage, we have symbolic algebra, in which solutions largely appear in a mathematical shorthand made up of symbols having little apparent connection with the entities they represent.

Diophantus is thought to have been the first person to introduce syncopated algebra. It is both interesting and puzzling to realize that it was more than a thousand years later before syncopated algebra appeared in Europe.

Diophantus wrote three books (book means a set of scrolls), the most famous of which was his *Arithmetica* in which he stated and solved about 130 polynomial type questions. The following are two examples taken from his book. In these examples, “number” is understood to mean “positive rational number.”

Problem 28, Scroll II: Find two square numbers such that their product added to either gives a square number. (Diophantus’s answer: $(3/4)^2, (7/24)^2$.)

Problem 10, Scroll IV: Find two numbers such that their sum is equal to the sum of their cubes.

Today, we speak of algebraic equations whose solutions are rational numbers as Diophantine equations.

Given two points in the plane, (a, b) and (c, d) . How are the coordinates of the midpoint of the line segment joining the two points related to the coordinates of the end points? Is there a sense in which the midpoint of the line segment could be called the “average of the end points”?

Suggestion.

- a. Choose two points.
- b. Plot the line segment joining the two points. Let (x, y) denote the midpoint of the line segment. (Using graph paper, you can estimate the numerical values of x and y .)
- c. Determine the equation of the line segment that joins the two points.
- d. Define x to be the average of the first components of the end points?
- e. Define y to be the average of the second components of the end points?
- f. Determine if (x, y) is the midpoint of the line segment. (That is, is the distance of (x, y) from each end point the same?)

Repeat the above suggestion with different points. Can you now make a conjecture and give a verification of your conjecture? If not, continue repeating the suggestion until a conjecture becomes clear.

[7] **Notices**

A Writing Workshop for the Editorial Board for a new College Algebra text will meet at Texas Southern University April 3-4, 1998.

The Deadline for contributions to our April Newsletter is Monday, April 6, 1998. Please send material to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.