Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

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[1] College Algebra for Business Students

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I strongly believe that business students need to have a firm foundation in college algebra and optimization techniques. The College of Business Administration at Savannah State University—as do other AACSB accredited business schools—require students to complete several quantitative courses in its curriculum. Successful completion of these quantitative business courses require students to be able to solve word problems, plot data, interpret data plots, interpret mathematical answers and write explanatory paragraphs, and to develop skills in real-life problem solving and modeling. In addition, we want our business students to be comfortable solving word problems and working with actual data and the various software packages for data analysis.

Therefore, I was delighted to see the table of contents for the text, "Contemporary College Algebra," by Professor Don Small. As a professor who teaches business statistics and management science, it was refreshing to see that his textbook addresses basic algebra skills as well as some of the optimization techniques so critical to the academic and real-world success of our business students. Indeed, I would encourage our mathematics professors to adopt this textbook so that the students at Savannah State University are better prepared to excel in their respective major coursework. Well Done!

[2] Fundamental Skills

(Elementary Algebra)

This is another reminder "prod" to help our students learn fundamental skills. The suggestion this month is only a slight variation from what was suggested in the past two Newsletters. The suggestion is to think of fundamental skills as a piano teacher thinks of scales. A piano student plays scales at the beginning of a lesson in order to "warm up the fingers," but playing the scales is not the objective of the lesson. In a similar fashion, a brief practice on fundamental skills at the start of a college algebra class can be used to "warm up the mind," although mastering the fundamental skills is not the objective of the class.

* Supported by the U.S. Military Academy.

Pair off the students and give each pair one of the equations on the following list or a similar one that you make up. After three minutes, ask a pair to present and explain their answer. Invite other students to comment.

For each of the following equations, state if it is True or False and then give an example that supports your answer. (For example, assign integer values to "a", "b", and "x" and then compute the value of each side of the equation.)

a. $\frac{1}{x+2} - \frac{2}{x+1} = -\frac{x+3}{(x+2)(x+1)}$

b. $(-a)^2 = -a^2$

c. $(a-b)^2 = a^2 - b^2$

d. $\sqrt{a^2 - b^2} = a - b$

e. $\frac{(x-2)x+4}{(x-2)^2} = \frac{x+4}{x-2}$

[3] Multiple Representation of Functions

Associate each of the following four function graphs (A, B, C, D) with

(a) The appropriate numerical description from the table of numerical function values.

(b) The appropriate algebraic equation from the list of equations.

(c) The appropriate real-life scenario from the list of scenarios

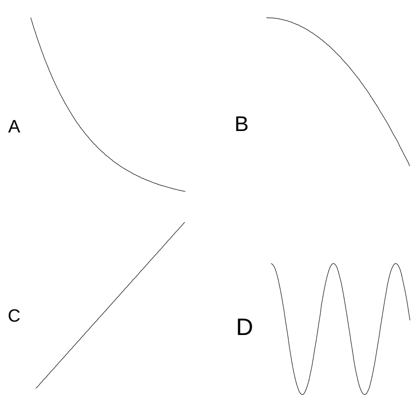

Table of numerical function values

x	$f(x)$	$g(x)$	$h(x)$	$h(x)$
1	-4	20	-0.42	20
2	2	10	-0.65	16
3	8	5	0.96	4
4	14	2.5	-0.14	-16
5	20	1.25	-0.84	-44

List of equations

$u(x) = \cos(2x)$

$v(x) = 40/2^x$

$w(x) = 6x - 10$

$y(x) = -4(x-1)^2 + 20$

List of Scenarios

1. Speed of a car when the driver suddenly spots a police cruiser.
2. Internal temperature of a baked potato that is taken out of the oven and placed on a kitchen counter.
3. Cost of renting a car for a day from an agency that charges $30 per day plus 20 cents per mile.
4. The number of hours of daylight starting at noon.

[4] Truck Camper Production

Suppose you are the owner of a company that manufactures and sells campers for pick-up trucks. Realizing that your largest expense is the cost of labor, answering the question of how many laborers to hire is critical. Certainly you need some laborers for otherwise no campers would be built. However, hiring too many laborers may be counter productive for the size of your facilities.

Assume you have tracked the number of laborers and camper production for several quarters (3 month periods) and have developed the following model

$$C(L) = 4200 \cdot e^{-8e^{-0.05 \cdot L}}$$

where L is the number of laborers used per year and C is the number of campers produced per year given L. You also know that the price of labor and other variable costs is $35,000 per laborer-year and that each camper sells for $800 wholesale.

a. Plot the model of the number of campers produced as a function of the number of laborers employed. Interpret your graph with respect to the question of: How many laborers should be employed?

Further information on the optimal number of laborers to be employed is given by developing a profit model in terms of the number of labors. A profit model is simply:

Profit = Revenue - Cost,

where

Revenue = Price * (No. Campers Sold)
Cost = Labor Price * (No. Laborers)

Substituting into the profit model for Revenue and Cost yields:

$$P(L) = 800 \ * C(L) - 35000 * L$$

b. Plot the profit graph.

c. Interpret the profit graph to determine the optimal number of laborers to employ in order to maximize profit.

[5] Benefit Party

The organizers of a Benefit Show believe that the demand for tickets is a linear function of the ticket price. Furthermore they assume that 60 people will buy tickets if the price is $50 per ticket while 100 people would buy tickets if they were only $30 a piece.

a. Develop a linear model showing ticket demand as a function of ticket price.

b. Plot your ticket demand model.

c. Interpret the meaning of the demand intercept on your plot.

d. Interpret the meaning of the price intercept on your plot.

The revenue function represents the amount of money the organizers take in from the sale of tickets. Thus the revenue function is the ticket price times the ticket demand at that price.

e. Determine the revenue function.

f. Plot the revenue function.

g. Determine the ticket price that will yield the maximum revenue.

The organizers assume that their expenses will be $20 per person plus $100 to rent a hall.

h. Create a profit function in terms of the ticket price.

i. Plot your profit function.

j. Determine the ticket price that will yield the largest profit.

k. Discuss a comparison of the ticket price that maximizes revenue with the ticket price that maximizes profit. Are they the same? Does that make sense? If the prices are different, which is larger? Is there a scenario in which the prices would be the same? Is there a scenario in which the present larger price would be the smaller price?

[6] Climbing Stairs (Recursive Squence)

In some abstract universe, the manner of climbing a flight of stairs is well correlated with the age of the person doing the climbing. Most people will climb stairs one at a time, however many college students will climb two steps at a time and some "long-legged" ones will take three steps at a time. The largest majority of people will climb by taking a combination of one or two steps at a time.

Your task is to model the number of ways that a person can climb a flight of n steps by taking one or two steps at a time.

Suggestion: Create a two-column table with the first column representing the number of steps and the second column representing the number of ways of climbing those steps by taking one or two steps at a time. For example if there are three steps, there are three ways of climbing them (3 single steps, a single step followed by a double step, a double step followed by a single step). Continue building your table, until you recognize a pattern. Once you understand your pattern, you are ready to define your variables and express your pattern as a recursive sequence. How do you test the validity of your pattern? (Answer: Apply it to the next entry in your table.) Now apply the third stage in modeling, interpret your recursive sequence in the setting of the original problem.

Follow-On Question:
Model the number of ways that a person can climb a flight of n steps by taking one, two, or three steps at a time.

[7] Notices

1. MAA PREP Workshop: *Revitalizing College Algebra*, June 18-21, 2007 at the University of Arizona. Facilitators are Don Small, Bill McCullum, and Bill Haver. The workshop is co-sponsored by the MAA and the Institute for Mathematics and Education (Univ. of Arizona). Registration Fee: $300 by May 7, $400 after May 7. (Registration fee, before May 7, is reduced to $200 for the second, third, and fourth participants from the same department.)

2. Deadline for contributions to the September Newsletter is Monday, September 3, 2007. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.

3. To subscribe to this Newsletter, write 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.

Talking, although important, is not teaching.
Listening, although important, is not learning.
anonymous