FINANCIAL ALGEBRA

STRATEGIES FOR TACKLING THE MATHEMATICS

General Teaching Tips and Information

How can you get help with mathematics concepts as you navigate through the actual teaching of the course during the school year? Here are some suggestions for getting your mathematics questions answered as you encounter them. Some of the suggestions might be better suited to certain types of questions than others. For example, a lengthy explanation on something very graphical would not be best addressed over the phone.

- Before teaching the course, you should get your own copy of a precalculus book, a statistics book, and an algebra 2 book.
- Financial Algebra list serv—You can pose questions on the list serve.
- E-mailing the authors—You can e-mail the authors for answers to questions that can be appropriately handled via e-mail.
- Websites—There are many mathematics help websites. A list of some of them appears in the next part of this packet. The Kahn Academy has online videos of math lessons on many topics. You can also do your own online searches.
- National Honor Society students—In many schools, students are required, as part of their membership in the National Honor Society, to do some tutoring. An honors-level junior or senior could help you with the mathematics in *Financial Algebra*.
- Using department meetings—On departmental meeting days, it may be possible to have one math teacher per month released to work with the *Financial Algebra* teachers. This cooperative, interdisciplinary endeavor is something many superintendents like to promote.
- Private tutors—Find a mathematics teacher, HS student, or college student who does private tutoring. The one-on-one session is a great way to get personal attention to all the questions you have. High school students and college students are very inexpensive, and the investment may save enough time and stress to make it worthwhile.
- College math lab—If you are currently attending a college, they most likely have a math lab where graduate level math majors help students.

Sample Math and Finance Help Websites

www.purplemath.com **www.webmath.com** **www.math.com**

www.mathway.com **www.mathpower.com** **www.algebra.com**

www.mathtv.com/videos_by_topic ***Try Google searches, too!***

Instructor's Companion Website
www.cengage.com/school/math/financialalgebra

Financial Webpage
www.finance.yahoo.com

New York Stock Exchange
www.nyse.com

Securities and Exchange Commission
www.sec.gov

Bank Interest Rates
www.savingsaccounts.com

Credit Card List
www.index**creditcards**.com/**creditcardlist**.html

Car Values and More
www.kbb.com

The Internal Revenue Service
www.irs.gov

The Social Security Administration
www.ssa.gov

Home Ownership
www.freddiemac.com/corporate/buyown/english/preparing/right_for_you/

Insurance Information Institute
www.iii.org

Retirement Planning
www.socialsecurity.gov/retirement/
http://money.usnews.com/money/retirement

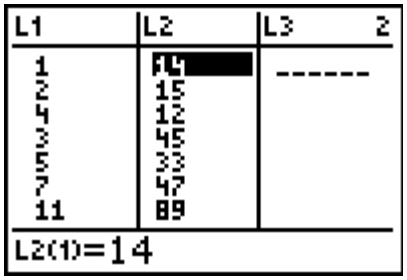
Using The Equation Editor

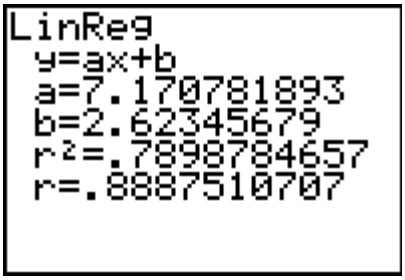
If you decide to up tests, quizzes, worksheets or review sheets, it is best to do the mathematical equations, etc., using the equation editor that comes as part of Word. If you have experience with it, we can go over any questions you have about using it. If you are new to the equation editor, you'll see how easy it is to use and how it makes all of your math documents look professional! For example,

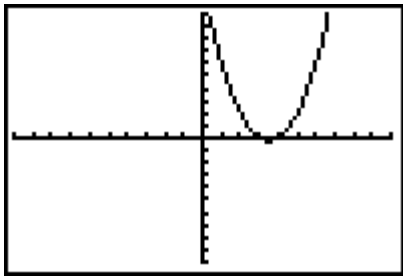
$$\sqrt{\frac{x^3 - 7x}{(x-4)}} = \left(\frac{5x - x_3^4}{2x} \right)$$

Using TI Connect to Print Calculator Screens

If you are using a TI calculator, you can download TI Connect for free from the Texas Instruments website. You need the cable that connects a calculator to a USB port. If you have a TI-83, the cable is different. You can include the calculator screens on any document you prepare for your class.







Tackling Specific Mathematics Topics

On the following pages we will discuss the major mathematical topics in *Financial Algebra*, and give some samples of examples in the book that use the skill being highlighted.

Literal Expressions and Equations

Students will encounter this skill consistently throughout *Financial Algebra*. Usually, in an algebra course, it is relegated to a unit on word problems, and then left to be forgotten. Consequently, students dislike word problems because they never became adept at modeling the situations with algebra. They will have tons of opportunities to practice this in the book.

Page 39 #13, 14.	Page 95 #3.	Page 214 #9.	Page 301 #22.
Page 392 #11	Page 399 #3.	Page 433 #7.	Page 463 #18.

Linear Regression, Correlation, and Scatterplots

Students will encounter this skill in several different chapters of *Financial Algebra*. This skill will always involve calculator use; hand computations are possible but unwieldy, and the formulas are lengthy. Students will have many opportunities to practice this in the book.

Page 68 #3.	Page 107 #6, 7, 8.	Page 237 #9.

Linear Regression, Correlation, and Scatterplots

Generally speaking, stronger linear correlations imply better linear fits. But there are some strange possibilities. The following four distributions have the same correlation coefficient, and the same regression line, yet their scatterplots look very different. For this reason, always encourage students to look at the scatterplot, and not just the correlation coefficient and the regression equation.

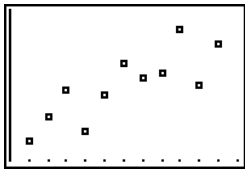
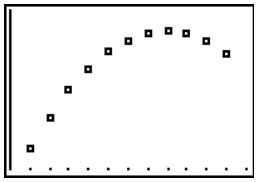
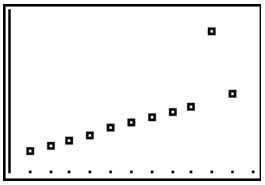
1. Look at the following sets of data. Enter them in your calculator.

L_1	L_2	L_3	L_4	L_5	L_6
10	8.04	9.14	7.46	8	6.58
8	6.95	8.14	6.77	8	5.76
13	7.58	8.74	12.74	8	7.71
9	8.81	8.77	7.11	8	8.84
11	8.33	9.26	7.81	8	8.47
14	9.96	8.1	8.84	8	7.04
6	7.24	6.13	6.08	8	5.25
4	4.26	3.1	5.39	19	12.5
12	10.84	9.13	8.15	8	5.56
7	4.82	7.26	6.42	8	7.91
5	5.68	4.74	5.73	8	6.89

2. Fill in the following table. ***Round to three decimal places***.

Use this for x-values	**Use this for y-values**	**Regression Equation—round to three decimal places**	**Correlation Coefficient—3 decimal places**
L_1	L_2		
L_1	L_3		
L_1	L_4		
L_5	L_6		

3. Now look at the scatterplots. With the same r and regression equation, look how different the scatterplots can be:


Systems of Linear Equations

There are several ways to solve these by hand. Two of these include elimination and substitution. Examples taught in typical algebra classes usually use numbers small enough to make the calculations less cumbersome, and you can use these if you want your students to learn, or review, the manual methods. When data is obtained form “real-life” sources, the calculator is usually used.

Page 82, Example 4	Page 85 #9.	Page 85 # 10

Use elimination:
$5x + y = 13$
$4x - 3y = 18$

Use substitution:
$4x + 3y = 27$
$y = 2x - 1$

Quadratic-Linear Systems of Equations

When solved by hand, the substitution method is usually used. When data is obtained form “real-life” sources, the calculator is usually used since the numbers are often large, and not “pretty.”

Page 89, Example 4	Page 90 #2	Page 105, Example 2

Getting a "Feel" For Compound Interest

Before deriving the compound interest formula, students need to get a feel for what compound interest is. They can do this by using the table.

Page 142 #11.

DATE→	DEC. 18	DEC. 19	DEC. 20
Opening balance			
Deposit			
Withdrawal			
Principal use to Compute interest			
Day's interest rounded to nearest cent			
Ending balance			

Deriving the Compound Interest Formula

Patterns are used to have students derive the compound interest formula.

Page 144, Example 1. Page 148 #4.

Limits, e, and Compounding Continuously

The formula for continuous compounding involves the natural base e. Students can use part of the compound interest formula and their calculators to compute e.

Page 153, Example 6. Page 154 #7.

$\left(1+\frac{1}{x}\right)^{x}$	**Value—Keep all Decimal Places**

Conjecture:

$$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x} =$$

Understanding Limits

The notion of a limit is a calculus concept, yet it can be shown to student via graphs and tables on calculators. Students first need to get comfortable with the notation. We'll look at some limits both ways.

Page 151, Example 2.	Page 171 #18.

Piecewise ("Split") Functions

Split functions are functions that are defined differently over different domains. When they are graphed, you need to keep careful track of the domain.

Page 222 #9.	Page 223 # 14.	Page 295 #11.
Page 320 #6.	Page 341 #8.	Page 494 #3

Modified Boxplots, Quartiles and Outliers

Box and whisker plots use special percentiles to show how a data set is distributed. They also display outliers, which are well-defined using a formula. The calculator can also draw modified boxplots.

Page 236 #.

The Average Daily Balance—Finding the Mean

The average daily balance is the mean of a month's worth of daily balances. Since the daily balance is the same for several days in a row, teach students how to set up a frequency column on their calculators.

Page 209 #6.

Have students use this 31-day "calendar" for average daily balance problems in the credit card unit..						

A Key Difference in Understanding the Nature of Linear and Exponential Functions

When introducing exponential functions to students, contrast the exponentials with linear functions. They may actually see a facet of linear functions that they had not internalized yet.

Y = 3x + 4		Show the Constant Addition
x	y	
1		
2		
3		
4		
5		
6		

Y = $7(3)^x$		Show the Constant Multiplication
x	y	
1		
2		
3		
4		
5		
6		

Introducing Exponential Functions: The Famous "Penny Doulbled Every Day" Problem

Exponential functions involve repeated multiplication. The best way to illustrate the "power" of exponents is to show the penny problem and the paper-folding problem. Kids will really enjoy both of these. Let them have the time to figure out both—don't give the answers—it spoils that "aha!" moment.

Page 302 #27

How many times must you fold a piece of paper so the thickness of the folded paper can reach from the Earth to the Sun?

Have students use this 31-day "calendar" and their calculators to answer the penny problem.						

Exponential Regression

Exponential functions have the general form $y = ab^x$. For percent depreciation, if a car loses 9% of its value each year, it retains (1 - .09) of its value each year. This yields the function $y = A(1 – r)^x$. If the data is entered on the calculator's lists, the exponential regression function can be found. The scatterplot helps students see whether or not an exponential function is a reasonable choice.

Page 257 #4. Page 287 #13.

Graphs with Cusps

Cusps are often introduced to students as part of a precalculus course, using absolute value functions. The fact that cusps in graphs can arise from real-life problems is eye-opening. The graphs of some split functions have cusps.

Page 222 #9.	Page 320 #6.	Page 339 Example 4.

The Monte Carlo Method for Finding Areas of Irregular Regions

There is a relationship between probability and area that can be used to find the area of irregular plane figures. Calculators are used to generate random numbers for the Monte Carlo method.

Page 397, Example 4. Page 400 #9. Page 400 #10. Page 433 #13.

The Area of a Regular Polygon

A regular polygon with n sides can be split into n isosceles triangles, each of whose area is ½ (base)(height). The height of the triangle is the radius of the inscribed circle, and this height, or radius, is also called the **apothem**. The bases add up to equal the perimeter, yielding the formula for a regular polygon with perimeter *p* and apothem *a* to be

$$A = \frac{1}{2}ap.$$

Page 396, Example 3. Page 399 #5. Page 432 #5.

The Expected Value of a Random Variable

Expected value, a probability topic students usually encounter in the AP Statistics curriculum, is used to study life insurance and contest winnings.

Page 468, Example 6.	Page 471 #11.	Page 471 #1.

The Greatest Integer Function

The greatest integer function is usually introduced in precalculus. It can used to model charges for cell phone use. On a TI-83 or TI-84 calculator, you can go to **MATH NUM 5 int()** to use the greatest integer function. The graph looks like steps; it is discontinuous.

Page 491, Example 3 Page 493, Example 6. Page 494 #3.