



Math SPIN News

Newsletter of the NADE Math SPIN

<http://www.nademathspin.org>

October, 2005

Contents

From the chair	1
Professional Development Opportunities	2
Web Site	2
Yahoo Group	3
Tips from Yahoo Discussion Group	3
<u>Feature Article:</u> The "Engineering Method" of Factoring	4

From the Chair

First of all, apologies for waiting so long to get the newsletter out. As with everyone else, things got hectic toward the end of the spring semester, and then the usual summer amnesia (that is, not thinking of much school-related stuff) kicked in. Also, no one had sent in any articles, at least not until September 30. Thanks to Russell Ellwood of El Paso Community College for his article on factoring.

Albuquerque was such a wonderful place to visit at the NADE conference in March! Once again we had a marvelous meeting of the Math SPIN. We had some good discussions both in our business meeting and in our three SPIN-sponsored sessions.

I want to give a hearty "Thank you!" to Diane Martling for serving as co-chair for the last two years. Diane has stepped down from that position so that she'll have enough time to put together and run the convention of her state AMATYC chapter next year. We'll miss her leadership, but the good news is that she'll still be active in NADE and the Math SPIN as a member and presenter.

We welcome our new co-chair, Sandy Gamble. Sandy is an associate professor at Grambling State University. She is past president of LADE. Due to a number of really pressing issues, she was unable to get a column for us this time. Look for one in the next issue.

Here's looking to another year full of promise in the Math SPIN!

Daryl Stephens

Articles needed for next newsletter

If you have any meeting you'd like to plug, a book or program you'd like to review, an opinion you'd like to express, an idea or success (or failure) story you'd like to share, etc., please send it in for the next newsletter by November 28. Submissions can be anywhere from a paragraph long to several pages. E-mail it to Daryl Stephens (stephen@etsu.edu) as a text, Word Perfect, Word, or RTF file or just in the body of an e-mail. The next newsletter will go out some time in December if we have submissions or January if we don't.

Professional Development Opportunities

NADE 2006 Conference,
February 15-18, 2006,
Philadelphia, PA
Philadelphia Marriott
Downtown



<http://www.nade2006.com>

The Math SPIN had submitted two SPIN-sponsored session proposals for open discussions, but they weren't accepted. However, there will be plenty of great math sessions.

3rd International Conference on "Teaching of Mathematics" at the Undergraduate Level (ICTM3). June 30 - July 5, 2006, Istanbul, Turkey

Please visit <http://www.tmd.org.tr/ictm3> for information about paper submission!

For more information, please contact:
Conference Chair, Ignatios Vakalis
ivakalis@capital.edu, Department of
Mathematics, Capital University
Conference Co-Chair, Deb Hughes Hallett,
Department of Mathematics, University of
Arizona

FREE Professional Development for Beginning/Intermediate Algebra Instructors

The Teachers Teaching with Technology College Short Course Program (T3 CSC) based at The Ohio State University is offering a fresh look at the developmental algebra curriculum and pedagogy. The Program's DEV short course is available free for 1 to 3 days on your campus (15 participant minimum). The DEV short course will investigate a beginning/intermediate algebra curriculum that uses a function approach and develops mathematical ideas in the context of real-world situations. We will use the Texas Instruments CBL 2™ (if requested), several apps, and the TI-

84 Plus™ SE. Course instructors include Debbie Crocker, Joe Fiedler, Peg Greene, John LaMaster, Ed Laughbaum, Charles Hofmann, Roseanne Hofmann, and Wade Ellis.

A Function Approach:

Teaching algebra from a function approach means using function, function representation, and function behaviors (but not function notation), to teach algebraic concepts and skills. This definition implies that function is an underlying theme throughout a course in algebra. It also suggests that a "function implementation module" is needed before any traditional algebra is taught. The DEV module provides content that begins with contextual numeric representations of functions and leads to students learning to move freely through representations with a graphing calculator. This is followed by an analysis of the geometric behaviors of functions integrated with studying parameter-behavior connections. The implementation module facilitates teaching of a slightly revised and re-ordered traditional developmental algebra curriculum, and allows us to capitalize on the cognitive learning concepts of associations, pattern recognition, attention, visualizations, priming, and an enriched teaching environment. These ideas play an extremely important role in teaching and learning of algebra, and are naturally and seamlessly integrated into the mathematics and pedagogy through using a function approach implemented with a graphing calculator. A graphing calculator is required for all students at all times – both in the implementation module and throughout the algebra course.

Teaching from a function approach means using functions to teach mathematics such as factoring, equation solving, arithmetic operations on polynomials, systems of equations, inequalities, properties of inequalities, definitions, concept of asymptotic behavior, absolute value, slope, laws of exponents, etc. Teaching students to move freely from numeric to graphic to symbolic, understand the connection of all these to real world situations, and understand the behaviors of basic functions, then teachers can "use" function, function representation, and function behaviors in the teaching of more traditional topics.

(Continued) ⇒

We are now offering the TI-84 Plus SE VS trade-up at all developmental algebra short courses for the remainder of the year. We will accept the following trade-ins: VS TI-83 Plus, VS TI-83 Plus, or a VS TI-83 Plus SE for a TI-84 Plus SE VS model. One trade-in allowed per DEV participant. The calculator traded in must be in workable condition and it must include the lid.

For more information and an application, please contact Ed Laughbaum, elaughba@math.ohio-state.edu or visit www.math.ohio-state.edu/shortcourse/. The presenter's expenses and honorarium are paid by a grant from Texas Instruments to The Ohio State University. The Ohio State University program is endorsed by the American Mathematical Association of Two-Tear Colleges, <http://www.amatyc.org/meetings.html>.

Web Site

Check out your Math SPIN web site at <http://www.nademathspin.org>. There you will find archived versions of old newsletters dating back to the early 1990s, links to many places on the web related to teaching developmental math (which will be undergoing a revision process this fall), and more.

Yahoo! Group

Remember that we have an e-mail discussion group through Yahoo that is available to all developmental math faculty. To view the archives of all 738 messages posted as of September 30, first get a free Yahoo account at www.yahoo.com if you don't already have one, then sign in and visit <http://groups.yahoo.com/group/mathspin/>.

To subscribe, send an otherwise blank e-mail to mathspin-subscribe@yahoogroups.com
To unsubscribe, send an e-mail to mathspin-unsubscribe@yahoogroups.com
To post a message, send an e-mail to mathspin@yahoogroups.com.

There are also (almost completely unutilized) provisions for posting files, pictures, links, and surveys on our Yahoo group site as well. Maybe we should take advantage of these! There is also an electronic calendar. Perhaps you would like to post dates of conferences of interest to our membership. (We have just added the dates of the NADE conference in Philadelphia as a start.)

Tips from Yahoo Discussion Group: Graph Paper on the Web

There are several sites out on the web that will generate graph paper for you. Many of them allow you to specify paper size, type of lines, distance between lines, etc., and then will create a PDF file that you can print out or post on your own web page. Here is a list from some discussion on our Yahoo group. Thanks to Jim Guinness, Chris Reisch, and Laura Bracken for passing these along. Links to these sites will be added to our Math SPIN web pages.

- # <http://www.incompetech.com/beta/plainGraphPaper/> – creates a PDF file based on your specifications, or choose from several that are already made for you. It can also generate lined, hexagon, isometric, diamond, dot, and music staff paper, plus some things you've probably never heard of (Celtic knots and UK 174 paper).
- # <http://www.handygraph.com/> – add-in for MS Word. You can download a free trial version, and the full-blown version is \$22.
- # http://www.mathematicshelpcentral.com/graph_paper.htm – free pre-made PDF files of different kinds of graph paper.
- # <http://www.marquis-soft.com/> – a shareware program called Graph Paper Printer will allow you to create various kinds of papers: rectangular graph, polar coordinate, isometric, music manuscript, Lego, logarithmic graph, dot, pistol shooting targets, patterns, and more. The fee is \$20.

FEATURE ARTICLE	The "Engineering Method" of Factoring by Russell Ellwood, El Paso Community College
--------------------	--

Factoring a quadratic trinomial seems to be one of the most difficult tasks for math students, especially when the coefficient of the x^2 term is not 1. For decades, the only two methods I had ever heard of were Factoring by Trial and Error, and Factoring by Grouping. But upon my arrival at El Paso Community College this summer, Dr. Joanne Peoples shared a third method with the other math instructors. It is called the Engineering Method of Factoring, and students find it much easier than either of the other two methods. After stating the method below, I share a proof that I wrote -- both to convince myself that it works in all cases, and to understand it better. Finally, I provide three examples at the end.

CLAIM: If $ax^2 + bx + c$ is a quadratic trinomial that factors (into two binomials) over the Integers, then two integers, r and s , can be found whose product is ac and whose sum is b . (That is, $r \cdot s = a \cdot c$ and $r + s = b$.) Then we can factor as follows:

$$\frac{(ax + r)(ax + s)}{a}$$

One or both of the factors in the numerator will have a number that can be factored out. The factored out number(s) will divide out the a in the denominator, leaving the denominator equal to one. We will then have the factored trinomial!

PROOF: Suppose $ax^2 + bx + c$ is factorable (into two binomials) over the Integers. Then there exist four integers n_1 , n_2 , n_3 , and n_4 , such that $ax^2 + bx + c = (n_1x + n_2)(n_3x + n_4)$.

Hence, $ax^2 + bx + c = n_1 n_3 x^2 + (n_1 n_4 + n_2 n_3)x + n_2 n_4$, and therefore $a = n_1 n_3$, $b = (n_1 n_4 + n_2 n_3)$, and $c = n_2 n_4$.
Then $ac = n_1 n_3 \cdot n_2 n_4 = n_1 n_4 \cdot n_2 n_3$.

Therefore $n_1 n_4$ and $n_2 n_3$ are the two integers whose product is ac and whose sum is b .

Let $r = n_1 n_4$ and $s = n_2 n_3$.

Then we can write

$$\frac{(ax + r)(ax + s)}{a} = \frac{(n_1 n_3 x + n_1 n_4)(n_1 n_3 x + n_2 n_3)}{n_1 n_3}$$

$$= \frac{n_1(n_3x + n_4) \cdot n_3(n_1x + n_2)}{n_1n_3} = (n_3x + n_4)(n_1x + n_2)$$

= $(n_1x + n_2)(n_3x + n_4)$, which is the factored trinomial!

EXAMPLES:

1. Factor $6x^2 + 11x + 4$.

Now $ac = 6 \cdot 4 = 24$. So we need two numbers whose product is 24 and whose sum is 11. These numbers are 8 and 3.

So we factor as

$$\frac{(6x + 8)(6x + 3)}{6} = \frac{2(3x + 4) \cdot 3(2x + 1)}{6} = (3x + 4)(2x + 1).$$

2. Factor $3x^2 + 4x - 4$.

Now $ac = 3(-4) = -12$. So we need two numbers whose product is -12 and whose sum is 4. These numbers are 6 and -2.

So we factor as

$$\frac{(3x + 6)(3x - 2)}{3} = \frac{3(x + 2)(3x - 2)}{3} = (x + 2)(3x - 2).$$

3. Factor $2x^2 - 7x - 30$.

Now $ac = 2(-30) = -60$. So we need two numbers whose product is -60 and whose sum is -7. Since their product must be negative (because -60 is negative), one of the numbers must be negative and the other one must be positive. This tells us that the absolute values of the two numbers must differ by 7 (since adding a positive number to a negative number means we end up subtracting). So the numbers will be 5 and -12 (we know that the larger number [the 12] must be the negative one, since their sum must be negative [that is, they must add up to -7, not 7]).

$$\text{So we factor as } \frac{(2x + 5)(2x - 12)}{2} = \frac{(2x + 5) \cdot 2(x - 6)}{2} = (2x + 5)(x - 6). \#$$