

The TI-89 for TI-83ers

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- TI-83: “think green”
- The Computer Algebra System
- **F6**: NewProb
- ‘by hand’ Algebra
- Close all parentheses ()
- **F2**: Algebra
- **F3**: Calculus
- Use **CATALOG** for *syntax hints*
- Use the **History**
- Editing includes *select, cut, copy, paste, Home, End*
- Save your **Homework!**
- Organize your files: folders



Problems from the *AMTNJ* HS Mathematics Contest:

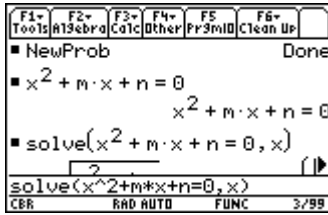
- Find, in terms of m and n , the sum of the reciprocals of the roots of $x^2 + mx + n = 0$ (solution follows)
- For how many values of x , where $10^{-4} < x < 10^4$, is $\log_2(x)$ an integer?
- Solve for x to the nearest hundredth: $x^{-1} + x^{-2} = x^2 - 5$ (solution follows)
- Solve for x : $\cos(2x) = \sin(x) - 2$ for $0 \leq x \leq 2\pi$
- Solve for x : $\frac{e^x + e^{-x}}{2} = 3, x \geq 0$

Web Resources:

- John Hanna: <http://www.johnhanna.us>
see ‘calculator’ and ‘software’
- TI Education: <http://education.ti.com>
see Educators ‘button’: **Classroom Activities**
- T³ – Teachers Teaching with Technology: <http://education.ti.com/t3>
Teaching resources, Summer Institutes and Conferences

Step-by-Step

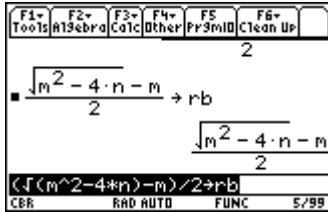
1. Find, in terms of m and n , the sum of the reciprocals of the roots of $x^2 + mx + n = 0$



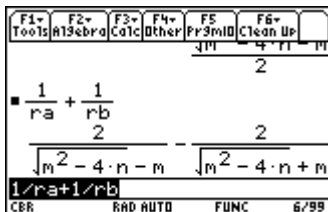
First, start a “NewProb” ([F6] 2:)

Enter the equation to solve (*for later use*)

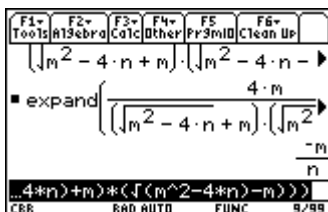
Use [F2]: **solve(** to solve for x : First, put the command down, then go up (⊖) and retrieve (ENTER) the equation, then type a ‘comma’ and the letter x , close parentheses, and press [ENTER] to evaluate the command.



Use copy and editing tools to store the two roots in the variables ra and rb . Follow the presenter!

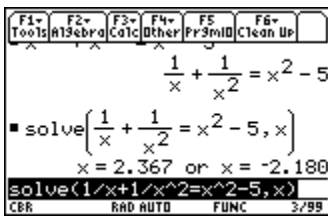
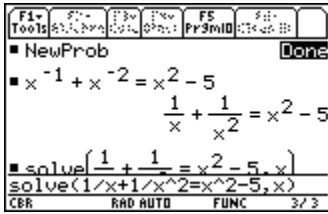


Evaluate $1/ra + 1/rb$. Look good? (NO), but it IS right.

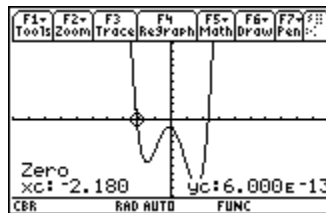


Use [F2]: **expand(** and [F2]: **comDemon(** to simplify the expression. First, put the command down, then go up (⊖) and retrieve (ENTER) the last result, then press [ENTER] to evaluate.

2. Solve for x to the nearest hundredth: $x^{-1} + x^{-2} = x^2 - 5$



Or (the “traditional” (!!)) method) ...



Managing your work: Folders and files

To make a folder:

- Press VAR-LINK (**2nd**[-])
- Press **F1** Manage, and choose **5: Create Folder**
- Enter a 'legal' folder name and press **ENTER**

To make a folder the 'active' folder:

- Press **MODE**,
- Go down to the '**Current Folder...**' setting,
- Press **▶** to see the list of folders to choose from.
- Press **ENTER** to choose it and
- Press **ENTER** again to save the mode settings.

To 'Save your HOME work':

- Press **F1 Tools**
- Choose **2: Save Copy As...**
- If you like,
 - choose a different folder by pressing **▶** and choosing one from the list.
- Press **◀** to go down to the filename textbox and
- Type a 'legal' file name.
- Press **ENTER** to enter it and
- Press **ENTER** again to save and close the dialog box.

To retrieve and use your saved HOME work:

- Use the Text Editor App to open your saved file (Press **APPS**).
- Feel free to edit the file.
- A horizontal split screen with the text file on top and the HOME screen on bottom looks best: use the **MODE** screen to set it up.
- Execute C: command lines: Press **F4** on each line.

Miscellaneous screens

1

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	NewProb			Done	
■	factor(74)			2·37	
■	factor(54)			2·3 ³	
■	1·2·27·37			1998	
CALCULUS RAD AUTO FUNC 4/30					

Numerical

2

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	$h = \frac{200}{\pi \cdot r^2} \mid r = \frac{10^{2/3}}{\pi^{1/3}}$				
	$h = \frac{2 \cdot 10^{2/3}}{\pi^{1/3}}$				
CALCULUS RAD AUTO FUNC 7/30					

Volume of a can

3

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	NewProb			Done	
■	$\frac{1}{\sqrt{2}}$			$\frac{\sqrt{2}}{2}$	
■	$\sqrt{16+28}$			$2\sqrt{11}$	
■	$\pi \cdot 6^2$			$36 \cdot \pi$	
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Symbolic answers

4

F1+	F2+	F3+	F4+	F5+	F6+	F7+
Tools	Zoom	Edit	✓	All	Style	Plot...
*PLOTS						
Plot 2:						
Plot 1:						
√y1=	$5 - x^2, x \leq 1$					
	$x + 2, \text{else}$					
y2=	$x^2 - 1$					
y3=						
y1(x)=when(x≤1,5-x^2,x+2)						
CALCULUS RAD AUTO FUNC						

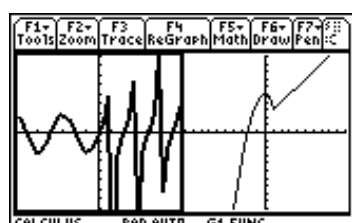
Piecewise graphing

5

F1+	F2+	F3+	F4+	F5
Tools	Command	View	Execute	Find...
■	1998 AB-1			
C:	NewProb			
■	a)			
C:	$f(\sqrt{x}, x, 0, 4)$			
■	b)			
C:	$\text{solve}(f(\sqrt{x}, x, 0, h)=8/3,$			
	h)			
■	c)			
C:	$f(\pi * (\sqrt{x})^2, x, 0, 4)$			
CALCULUS RAD AUTO FUNC				

Scripting

6

F1+	F2+	F3	F4	F5+	F6+	F7+
Tools	Zoom	Tracs	ReGraph	Math	Draw	Pen...
						
CALCULUS RAD AUTO G1 FUNC						

Two graphs

7

F1+	F2+	F3+	F4+	F5
Tools	Command	View	Execute	Find...
■	$\tan^{-1}(\infty)$			
■	$\ln(0)$			
■	$e^{(-\infty)}$			
■	67			
■	$f(-1)$			
■	$f(-i)$			
■	$e^{(i\pi)}$			
■	$\sin^{-1}(-2)$			
■	$(-8)^{(2/3)}$			
CALCULUS RAD AUTO FUNC				

Special numbers

8

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	NewProb			Done	
■	$3 \cdot x + 5 \cdot x$			$8 \cdot x$	
■	$3 \cdot x + 5 \cdot x \mid x = 3$			24	
■	$3 \cdot x + 5 \cdot x$			$8 \cdot x$	
■	$3 \cdot x + 5 \cdot x \mid x = a$			$8 \cdot a$	
$3x+5x \mid x=F$					
CALCULUS RAD AUTO FUNC 5/30					

"simple" algebra

9

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	$\text{factor}(x^4 + x^2 - 12)$				
	$(x^2 - 3) \cdot (x^2 + 4)$				
■	$\text{factor}(x^4 + x^2 - 12, x)$				
	$(x + \sqrt{3}) \cdot (x - \sqrt{3}) \cdot (x^2 + 4)$				
$\text{factor}(x^4 + x^2 - 12, x)$					
CALCULUS RAD AUTO FUNC 3/30					

"better" algebra

10

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	$\text{expand}((x - 5)^5)$				
	$x^5 - 25 \cdot x^4 + 250 \cdot x^3 - 1250$				
■	$\text{expand}((\sqrt{x - 1} + 2)^2)$				
	$4 \cdot \sqrt{x - 1} + x + 3$				
CALCULUS RAD AUTO FUNC 3/30					

More cool algebra tools

11

F1+	F2+	F3+	F4	F5
Tools	Command	View	Execute	Find...
■	solve...			
■	$3x - 2y = 7$			
■	$4x + 5y = 18$			
■	$\text{solve}(3x - 2y = 7, x)$			
■	$\text{solve}(4x + 5y = 18, y) \mid x = \dots$			
■	$x = \dots \mid y = \dots$			
CALCULUS RAD AUTO FUNC				

Simultaneous equations

12

F1+	F2+	F3+	F4+	F5	F6+
Tools	Algebra	Calc	Other	Pr3mid	Clean Up
■	Define $\sec(xx) = \frac{1}{\cos(xx)}$			Done	
■	$\sec\left(\frac{\pi}{6}\right)$			$\frac{2\sqrt{3}}{3}$	
HANNA RAD AUTO FUNC 2/30					

Defining functions

Volume of a can:

A tin can is to be constructed in the shape of a cylinder and is to hold 1 liter of soup. Determine the dimensions of the can (radius and height) that minimize the surface area of the cylinder.

- NewProb
- **Define** the formula for the Surface Area of a cylinder (the function to minimize, in terms of h and r).
- **Enter** the *equation* for the Volume of the cylinder.
- **Solve** the Volume *equation* for h .
- Now replace the h in the Surface Area function with its equivalent expression in terms of r .
- Next...?
do the math!

Prime?

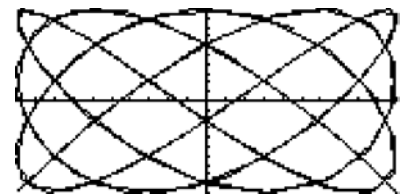
Fermat proposed that $F(x) = 2^{(2^x)} + 1$ is *prime* when x is a Natural number. What is the first value of x for which this conjecture fails?

Fun stuff

What is the square root of
12345678987654321?

What is the slope of $y=|x^x|$ at $(0, 1)$?

Find the area of the largest rectangle that has one side on the positive x -axis and the other two vertices on the function $y=xe^{-x}$



Lissajous