Systems of Linear Equations

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Name _____

Activity Overview

Using the on−screen directions and the more detailed directions here, students will investigate four ways to solve systems of linear equations: graphically, numerically, with a data table and by matrices. Some prior familiarity with the basic functions of the TI−nspire CAS is needed. Students should be able to navigate between pages. Students should be able to use the menu functions on each screen.

Concepts

Algebra: Systems of Linear Equations

Teacher Preparation

Load .tns file "equations" onto handhelds. Print copies of instructions for students or the lesson can be conducted as a teacher led activity. Most of the work is shown on the screen shots. These could be changed prior to loading on student handhelds if the activity is to be teacher led.
The matrix solution should be done after some explanation of reduced row echelon form is given in class

TI−nspire Applications

TI−nspire calculator, graphs and geometry, lists and spreadsheets.

Evaluation

1. Complete the activity and write solutions to the systems of equations.
2. Write about the easiest or best way to solve a system of equations and explain why you chose that method. .

Notes to teacher

This can be used as part of lessons over several days, teaching a traditional paper and pencil approach to systems of linear equations first and then following with the TI−nspire CAS. Any part of the calculator lesson can be used to introduce a system of linear equations.

For Algebra I level students, I would recommend using simpler equations where the intersection points are integers. The graphing approach is often the easiest for students to understand as an initial approach. Linear combination is done first here using a CAS version of the TI−nspire. Without a CAS system, graphing can come first.

This can serve as a review for Algebra 2 or Pre−Calculus students. The rref matrix solution is best used after students have some familiarity with matrices. An explanation of what the calculator does to solve a system of equations with matrices should precede the easy way to get an answer using rref.

Please feel free to use any part of this lesson with your classes and edit as needed.

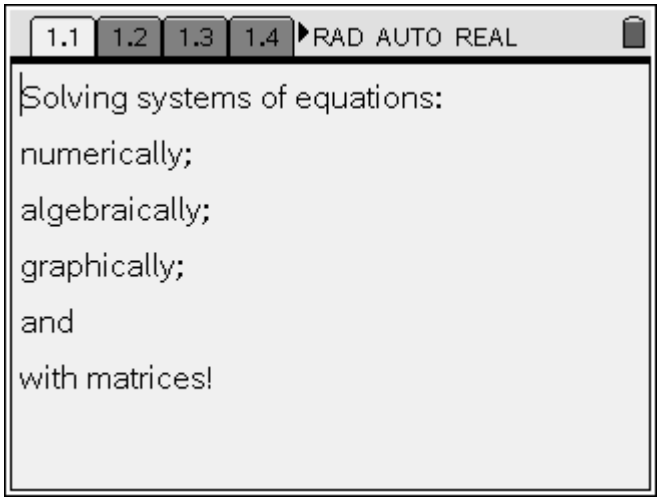
In this activity, you will explore:

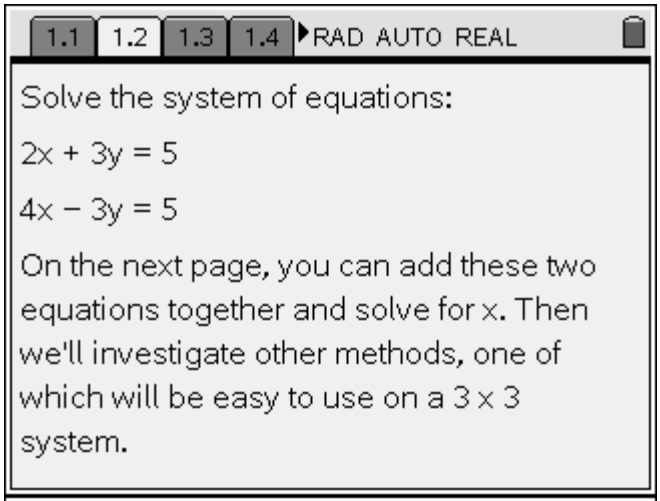
4 ways to solve systems of Linear Equations

Open the file equations.tns on your handheld and follow along with your teacher to complete the activity. Use this document as a reference and to record your answers.

Linear equations have x and y raised to the first degree (but not multiplied by each other.)

Push ctrl ▶ to go to page 1.2.
Page 1.2 has the two equations we'll be working on throughout this lesson.

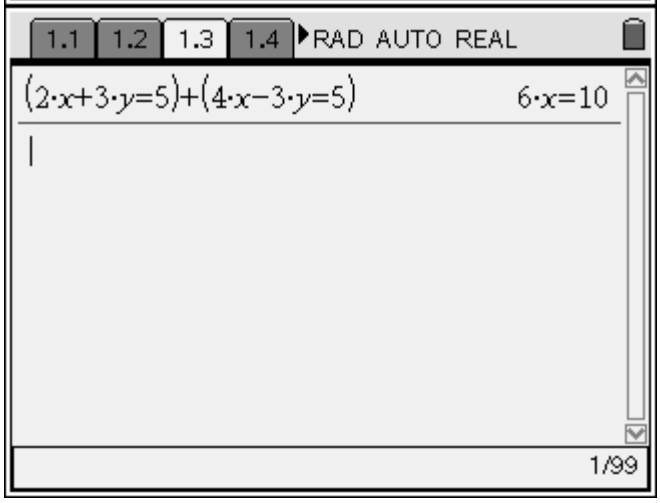




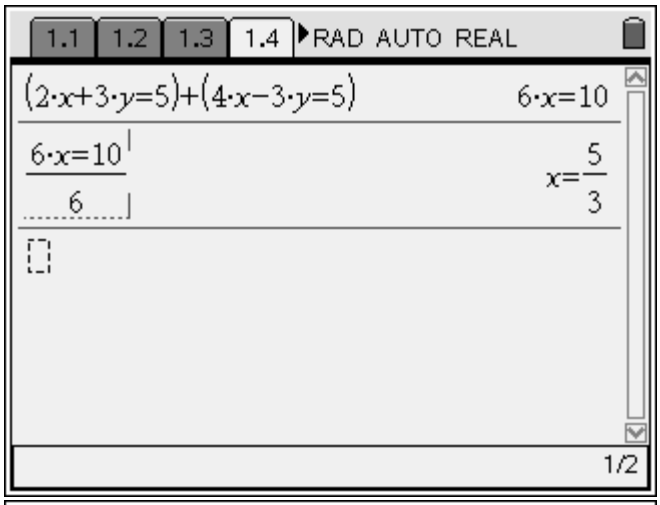
Push ctrl ▶ to go to page 1.3.

ALGEBRAICALLY

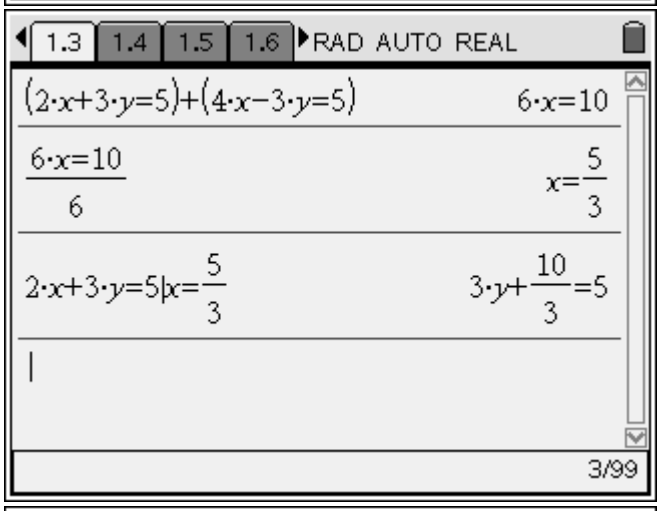
1. Given a system of 2 linear equations, they intersect in a single point represented by an ordered pair.
2. On page 1.2 you have two equations of lines in standard form. This is a calculator page and you can use the calculator feature of the TI−nspire CAS to solve the system.
3. Type the first equation putting it inside parentheses, then the "+" sign, then the second equation, also enclosed in parentheses.
4. Hit enter.



1. Continuing on the same page, move the cursor up until your last answer is highlighted, then hit enter.
2. Divide by 6, hit enter.

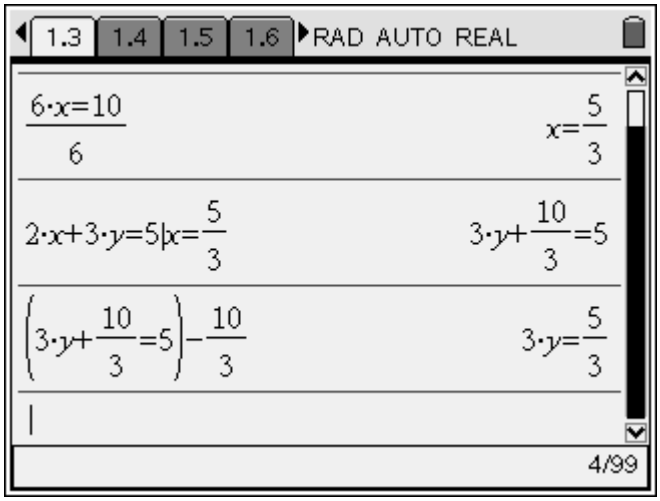


1. Continuing on the same page, type the first equation again.
2. After the expression, use the "such that" key. (|) It's located just below and to the right of the ctrl key.
3. Follow "such that" with the solution you got for x by moving your cursor up to the x solution and hitting enter to paste it into the entry line.
4. Hit enter.



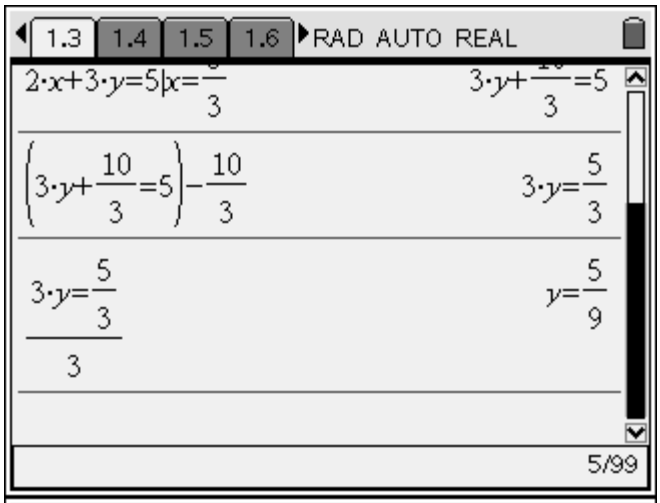
On the next line, simply subtract 10/3 and hit enter. This will subtract 10/3 from each side of the equation which was your answer.

When a scroll bar appears on the right edge of a page, you can cursor up or down on the NavPad to move a line at a time. If you want to move a page at a time, hold down the ctrl key, and use the 3 key at the same time to move down the page a panel at a time. Similarly use the ctrl key and 9 to move up a page at a time.

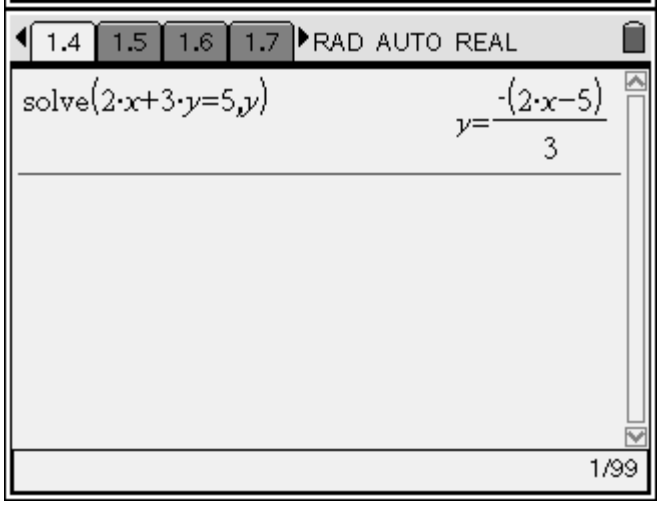


1. Now divide by 3 and hit enter. Again, this will divide both sides of the preceding answer, which was an equation, by 3.
You now have your y solution

2. Jot these two answers down. You'll need them again.

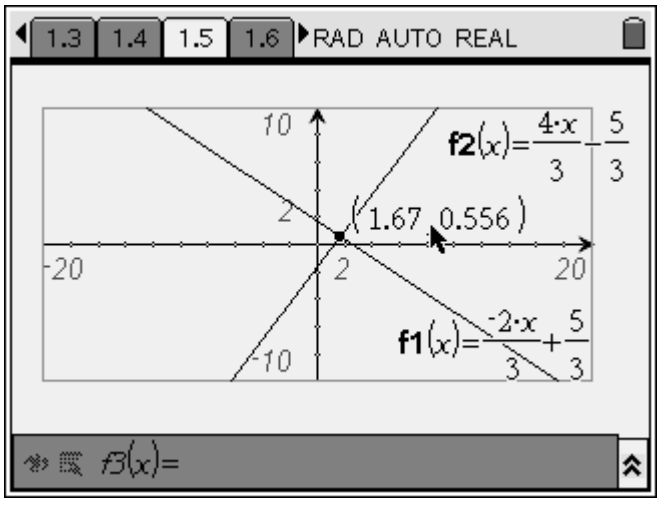


1. Move to page 1.4, (remember to get to the next page use ctrl ▶)
We'll use a feature of the CAS system next.
2. Use the menu key. Select Algebra (4), then Solve (1).
Type your first equation, followed by (,)y, then hit enter. This solves your equation for y in terms of x.
Do the same thing for your second equation and write down both of these answers.



Graphically

1. Move to the next page. (1.5)
This is known as a graphs and geometry page.
2. Go to the entry line at the bottom of the screen. Type your first "y =" answer from the previous page in f1(x), hit enter, then type the second "y =" answer.
3. Select menu, then 6 (points and lines), followed by 3 (intersection).
4. Move the cursor 'til one of the lines is highlighted, hit enter, then move 'til the second line is highlighted and hit enter again. The coordinates of the intersection appear on the screen.

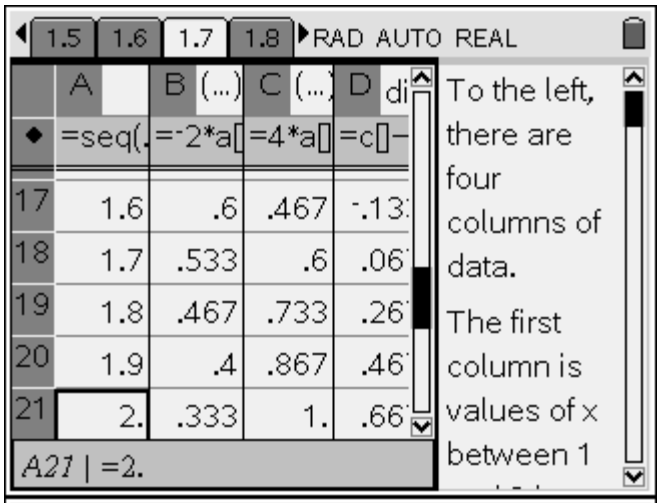


Numerically

The third method of solving a system of equations to explore on the TI−nspire is on a Data Table.

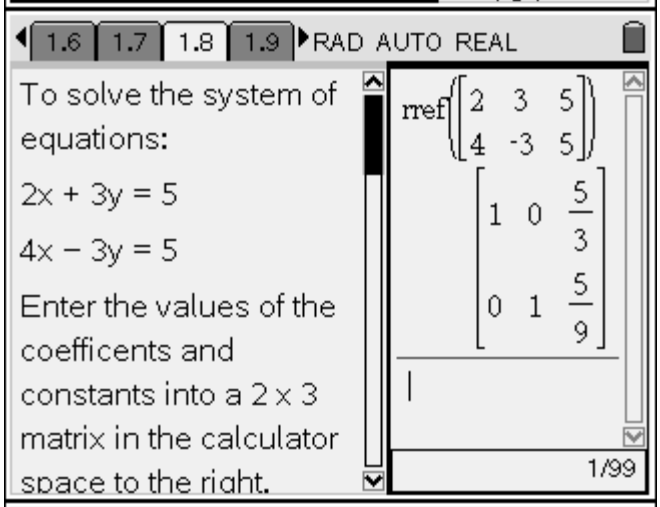
Page 1.6 has text describing the following page.

On this page are 4 columns of data. Column 1 has x values from 1 to 2 in increments of 0.1; the second column has f1(x) values from calculator page 1.5; the third column has f2(x) values, also from calculator page 1.5. The fourth column has the difference between the third and fourth columns.
When this difference is close to 0, the x column has the approximate solution for x and the two y values which will be close to each other approximate the y value for the solution.

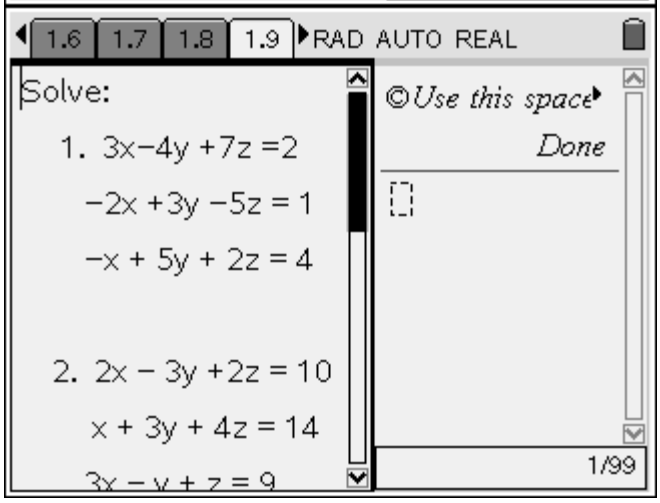


Matrices

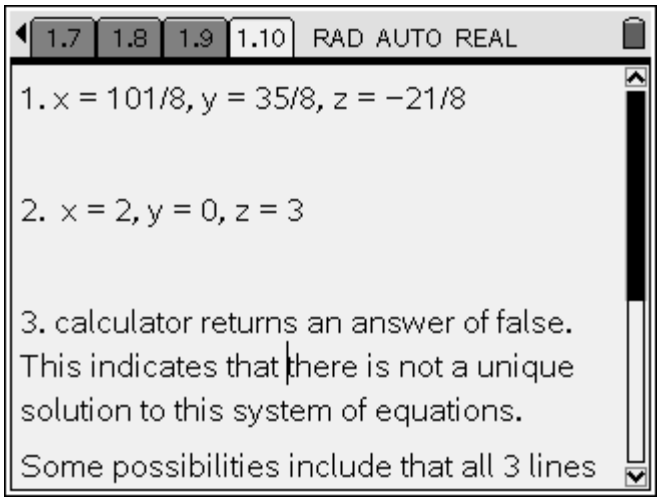
Another way to solve linear equations is matrices. Page 1.8 explains how to do this in the left panel of the screen. The right panel has an example problem.



Page 1.9 has 3x3 systems of equations to solve. There's a question at the end.



Page 1.10 has the answers to the 3x3 systems.



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