Solving Systems Using Matrices

ID: 8216

Time required
60 minutes

Activity Overview

In this activity, students will enter coefficients and constants from a system of equations into matrices. They will solve the system using the row reduction method. Students will also learn to use an inverse matrix to solve a system of equations quickly.

Topic: Linear Systems

- *Solve a system of two linear equations (in two variables) using matrices.*

Teacher Preparation

- *This activity is designed to be used in an Algebra 2 classroom. Students should be familiar with solving systems of linear equations from Algebra 1, although you may wish to review that the solution is the point(s) of intersection of the graphs of the equations.*
- *This activity is intended to be mainly **student-centered**, with breaks for whole-class discussion following each problem. The student worksheet guides students through the activity and provides a place for students to record their answers.*
- *Students should already be familiar with the basic concepts of matrices.*
- *Students should know that division by zero is undefined and zero divided by any nonzero number is zero.*
- ***To download the student worksheet, go to education.ti.com/exchange and enter "8216" in the keyword search box.***

Associated Materials

- *SolveSystemsUsingMatrices_Student.doc*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Numb3rs Season 3 – "Provenance" – Matrix Operations (TI-84 Plus family) — 7746*
- *Determinants and Inverse Matrices (TI-84 Plus family with TI-Navigator) — 2129*
- *All Systems Go! (TI-84 Plus family) — 10127*

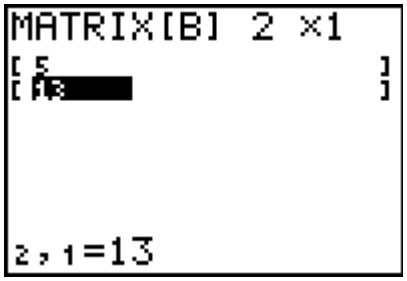
Problem 1 – Row Reduction Method

Students are given the following system of equations:

$2x + y = 5$

$5x + 3y = 13$

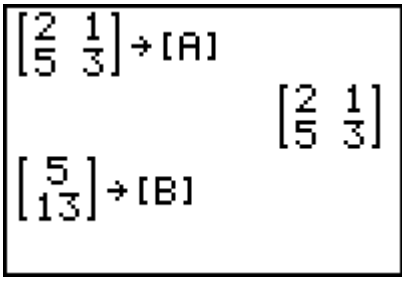
They will first enter the coefficients of *x* and *y* into a matrix A, a 2 by 2 matrix. Then they enter the constants into matrix B. This should be done within the EDIT menu of the MATRIX menu.



If using Mathprint OS:

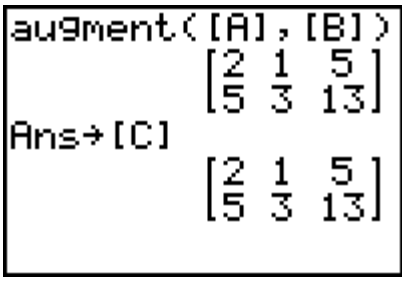
Students can create matrix A by pressing [ALPHA] [F3], highlight **2** for **ROW** and **2** for **COL**. Then press [ENTER] on **OK**. Enter the coefficients, arrow to the right side of the matrix, press [STO▸] [2nd] [MATRIX] and select [A].

Repeat for creating matrix B, selecting **2** for **ROW** and **1** for **COL**.



Now students will augment matrices A and B into matrix C using the **augment(** command from the **MATRIX > MATH** menu.

They are to store the result in matrix C, **3:[C]**.

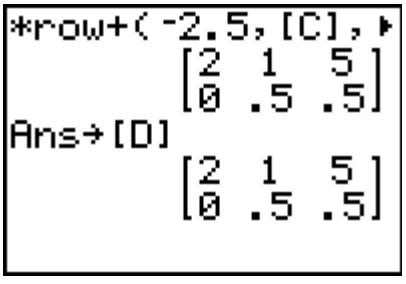


Step 1: Eliminate *x* by multiplying the first equation by –2.5 and adding it to the second equation.

Command: ***row+(-2.5, [C], 1, 2)**

(*row+ multiplies a row and adds it to another row.)

Store the result in matrix D.

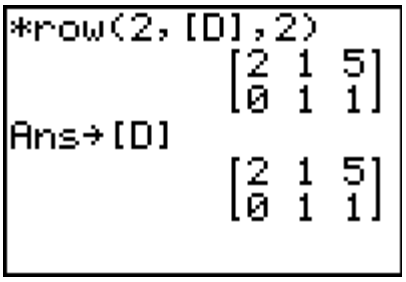


Step 2: Get the coefficient of *y* to be 1.

Command: ***row(2, [D], 2)**

(*row multiplies a row)

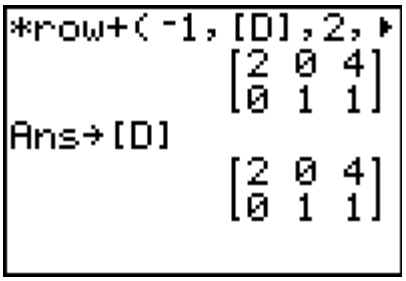
Store the result in matrix D.



Step 3: Eliminate *y* by multiplying the second equation by –1 and adding it to the first equation

Command: ***row+(-1, [D], 2, 1)**

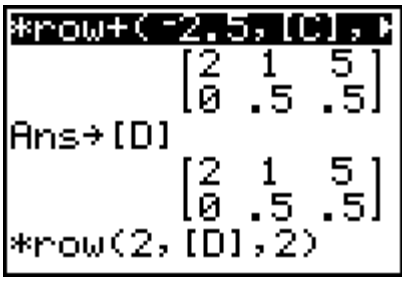
Store the result in matrix D.



If using Mathprint OS:

To save time, modify a previous entry. Press the up arrow key, ▲, highlight the appropriate entry and press ENTER. Then change the numbers as needed and press ENTER again.

For example, use the command from in Step 1 for the command in Step 3.

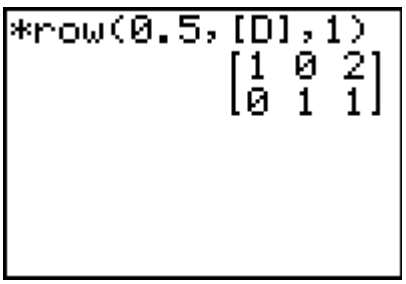


Step 4: Get the coefficient of *x* to be 1.

Command: ***row(0.5, [D], 1)**

Students now have the answer in the last column of the matrix. Explain to them that the top number is the *x*-value and the bottom number is the *y*-value.

The solution to the system is (2, 1).



Problem 2 – Inverse Method

Students can now use the inverse matrix as a quicker method for using matrices to solve systems. They will use matrix A, containing the coefficients of *x* and *y* and matrix B, containing the constants, which they stored at the beginning of the activity.

Key presses: 2nd [MATRX] 1 x^{-1} × 2nd [MATRX] 2

The resulting matrix contains the solution.