

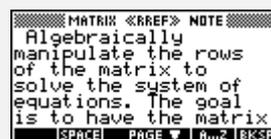
## Solving Systems of Equations Using Matrices For the Teacher

### Objectives:

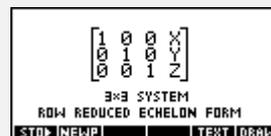
Using the **MATRIX <<RREF>>** applet, the student will solve systems of equations using Gauss-Jordan elimination. The student will algebraically manipulate the matrix to put it in row-reduced echelon form (RREF).

### Functionality:

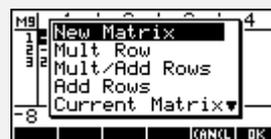
When the student presses **START**, the **MATRIX < RREF>** **NOTE** will be displayed.



The student should then view the **SKETCH** for further explanation.



Selecting **New Matrix** from **VIEWS** will randomly generate an augmented matrix that represents a 3X3 system of equations.



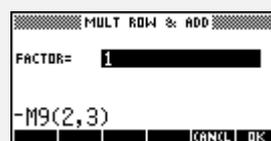
When the student selects any of the algebraic operation choices from **VIEWS**, a series of input boxes will prompt the student for the necessary information: factor, row number to be operated on, etc.



By using **Create Matrix**, the student may enter any appropriate matrix to be solved. **Current Matrix** will return to the current view of the matrix. Pressing **CANCL** while in the views will return you to the home screen.



Any entry can be recalled by typing the location as **M9(row #, column #)**. The example to the right takes the opposite of element in row 2, column 3 of M9. The original matrix is stored in **M8** and the matrix being worked on is located in **M9**.



**Additional Exploration:**

Enter an augmented matrix in **M1** of the Matrix Catalog. Return to the Home screen. In the edit line, enter **RREF(M1)** and store this in **M2**. View **M2** in the Matrix Catalog to see the system of equations in row-reduced echelon form. An example would be:

Solve the system of equations

$$\begin{aligned} x + y + z &= 6 \\ 2x - y - z &= -2 \\ x + 3y - z &= 4 \end{aligned}$$

M1	1	2	3	4
1	1	1	1	6
2	2	-1	-1	-2
3	1	3	-1	4

DEG	HOME
RREF(M1)►M2	
[[1,0,0,4/3],[0,1,0,1...]]	
STD	

M2	1	2	3	4
1	1	0	0	1.33333
2	0	1	0	1.00000
3	0	0	1	2.00000

This system of equations may also be solved by  $[A]^{-1}[B]$  where  $[A]$  contains the coefficients of the variables and  $[B]$  contains the constants. Let  $M1=[A]$  and  $M2=[B]$ . In the edit line of the Home screen, enter  $M1^{-1}M2$ . Store this in  $M3$  to

see the solutions in the form  $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ .

M1	1	2	3	
1	1	1	1	
2	2	-1	-1	
3	1	3	-1	

DEG	HOME
$M1^{-1}M2$ ►M3	
[[4/3],[11/6],[17/6]]	
STD	

M3	1			
1	1.33333			
2	1.00000			
3	2.00000			

Programs associated with this applet:

- .M.N, .M.M, .M.MA, .M.A, .M.SEE, .M.S, .M.C, .M.SV