

Purpose: To practice calculating the reduced echelon form with individual row operations

Prerequisite: Section 1.2

MATLAB built-in functions used: -, /

M-files used: replace, swap, scale from the laydata5 toolbox or from pearsonhighered.com/lay.

Background: Read about elementary row operations and reduced echelon form in Section 1.2.

1. (hand) For each matrix, calculate its reduced echelon form by hand. The last three matrices are exercises 9, 10, and 11 from Section 1.2, and it will be beneficial to you to keep a record of what was done in each step. Again, be sure to reduce all the way to **reduced** echelon form and to **show each step**:

$$\begin{bmatrix} 0 & 3 & 6 & 9 \\ -1 & 1 & -2 & -1 \end{bmatrix}$$

$$9. \begin{bmatrix} 0 & 1 & -6 & 5 \\ 1 & -2 & 7 & -6 \end{bmatrix} \sim$$

$$10. \begin{bmatrix} 1 & -2 & -1 & 3 \\ 3 & -6 & -2 & 2 \end{bmatrix} \sim$$

$$11. \begin{bmatrix} 3 & -4 & 2 & 0 \\ -9 & 12 & -6 & 0 \\ -6 & 8 & -4 & 0 \end{bmatrix} \sim$$

(MATLAB) We can use the MATLAB functions `swap`, `replace` and `scale` to do the same row operations on the same matrices as in question 1. One possible solution for the first matrix is shown to illustrate how the functions work. Try the example: type each command line shown, press [Enter], and verify the result. The first line enters the matrix and the second line makes a copy of it. It's a good idea to work on a copy so if you decide to start over, the original matrix is still in your workspace.

M =[0 3 6 9; -1 1 -2 -1]	0 3 6 9 -1 1 -2 -1
A = M	0 3 6 9 -1 1 -2 -1
A = swap (A ,1,2)	-1 1 -2 -1 0 3 6 9
A = scale (A ,2,1/3)	-1 1 -2 -1 0 1 2 3
A = replace (A ,1,-1,2)	-1 0 -4 -4 0 1 2 3
A = scale (A ,1,-1)	1 0 4 4 0 1 2 3

2. Now you use these functions to reduce the matrices in exercises 9, 10 and 11. To get the matrices from Laydata5 Toolbox, type the commands in bold below and press [Enter] after each line. You can find the MATLAB data for most problems in the text using this method.

cls2 (Chapter 1, section 2)
9 (Problem 9)
A=M (It's a good idea to work on a copy.)

As you reduce each matrix using MATLAB, **record each line** you type and **the resulting matrix**. If necessary, attach an extra sheet or use the back. To save your work to a computer file, use MATLAB's `diary` command or copy and paste from the Command Window. For more information regarding the `diary` command or creating script M-files, see the MATLAB appendix in Lay's study guide.

To learn more about the functions `replace`, `swap`, and `scale`, see Lay's Student Study Guide, or type **help swap**, **help replace**, or **help scale**.