Purpose: To practice calculating the reduced echelon form with individual row operations
Prerequisite: Section 1.2.
MATLAB functions used: *, /; and replace, swap, and scale from Lay’s Toolbox

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

1. (hand) For each of the matrices in exercises 9, 10, 12 and 13 in Section 1.2, calculate its reduced echelon form by hand. Be sure to reduce all the way to reduced echelon form, and show each step:

9. \[
\begin{bmatrix}
0 & 3 & 6 & 9 \\
-1 & 1 & -2 & -1
\end{bmatrix}
\sim
\]

10. \[
\begin{bmatrix}
1 & 3 & -3 & 7 \\
3 & 9 & -4 & 1
\end{bmatrix}
\sim
\]

12. \[
\begin{bmatrix}
1 & 2 & 4 \\
-2 & -3 & -5 \\
2 & 1 & -1
\end{bmatrix}
\sim
\]

13. \[
\begin{bmatrix}
2 & -4 & 3 \\
-6 & 12 & -9 \\
4 & -8 & 6
\end{bmatrix}
\sim
\]
2. (MATLAB) Now use the functions `swap`, `replace`, and `scale` to do the same row operations on the same matrices as in question 1. One possible solution for exercise 9 is shown, to illustrate how the functions work. Try the example: type each command line shown, press [Enter], and verify the result. The first two lines get the matrix, and the third 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.)

```matlab
c1s2
9
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
```

Now you use these functions to reduce the matrices in exercises 10, 12 and 13. Record each line you type, and the resulting matrix. Attach an extra sheet or use the back. To learn more about the functions, see Lay’s Student Study Guide, or type `help swap, help replace, help scale`.)