Math 495R Homework 14

(1) Write a function that takes a square matrix A and two positive integers i and j, and returns the matrix $A_{i,j}$ obtained by deleting the i-th row and j-th column of A.

(2) Write a function to compute the determinant of a matrix recursively, using the definition of the determinant from the text book (expanding across the first row). The base case should be a 1×1 matrix, which has determinant given by the entry itself. Don't forget the sign when computing the co-factors!

Test your function by computing the determinant of the matrix

$$A = \begin{bmatrix} 1 & 0 & 2 & 1 & -1 & 0 \\ 2 & -1 & 0 & 3 & 2 & 1 \\ 1 & 3 & 2 & -1 & 1 & 0 \\ 0 & 1 & 1 & 0 & -1 & -1 \\ -1 & 0 & -1 & 1 & 0 & 2 \\ 0 & 2 & 1 & 2 & 0 & -1 \end{bmatrix}$$

(3) Write a function to compute the determinant of a matrix using row reduction. You will want to modify your row-reduction function from the previous lab so that it keeps track of how each row operation changes the determinant. If you wrote your function according to the instructions given (i.e. no row scaling operations performed), you will only need to count the number of row-swaps performed. Recall that if s swaps were performed, the determinant changes by the factor $(-1)^s$. Once the matrix is in in echelon form, recall that the determinant is the product of entries in the main diagonal.

Test your function on the matrix A given in the previous part. Do your functions agree? Which method runs faster?