Your name:

(first) (last)

Question 1. Define a matrix A in Matlab, and reduce it to an REF by completing the following questions.

$$A = \begin{bmatrix} 1 & 0 & 4 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$

(a) Find the elementary matrix E_1 to carry out the following row operation.

$$A_1 = \begin{bmatrix} 1 & 0 & 4 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = E_1 A \qquad E_1 =$$

(b) Find the elementary matrix E_2 to carry out the following row operation.

$$A_2 = \begin{bmatrix} 1 & 0 & 4 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = E_2 A_1 \qquad E_2 = E_2 A_1$$

(c) Find the elementary matrix E_3 to carry out the following row operation.

$$A_3 = \begin{bmatrix} 1 & 0 & 4 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = E_3 A_2 \qquad \qquad E_3 =$$

(d) Find the elementary matrix E_4 to carry out the following row operation.

$$A_4 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = E_4 A_3 \qquad \qquad E_4 =$$

(e) Find $E_4 E_3 E_2 E_1$ and A^{-1} .

Question 2. Let A be a 3×3 matrix, and let $[A \ I]$ be the corresponding augmented matrix with identity matrix I. Suppose that we have computed a reduced echelon form:

>> rref([A eye(3)]) ans = 1.00000 0.00000 3.00000 0.00000 -8.00000 3.00000 0.00000 1.00000 0.00000 -2.00000 3.00000 -1.00000 0.00000 0.00000 0.00000 1.00000 -4.00000 2.00000

Then answer the following questions.

(a) Is A invertible? Why or why not?

(b) The series E_1, E_2, E_3, E_4 of elementary matrices reduce $[A \ I]$ into the REF in (a). Find the product $(E_4E_3E_2E_1)$ of all the elementary matrices.

(c) What was the matrix A in the first place? Find A, and perform rref([A eye(3)]) to see if it is correct. Describe the Matlab/Octave input and output as you performed.