Take home homework 1

MATH 3100.101   Linear Algebra etc

USA   7 February 2023

Due date: 15 February 2023.
Working together is OK. Using matrix algebra calculators is also OK. However, turn your *own* version of work in in *handwritten* form. Give exact answers where possible, no approximations unless explicitly stated.

1. Solve the system of equations

$$
\begin{array}{rcrcrcrcl}
x_1 & & & & & + & 3x_4 & = & 2 \\
x_1 & + & x_2 & & & + & 4x_4 & = & 3 \\
2x_1 & & & + & x_3 & + & 8x_4 & = & 3 \\
x_1 & + & x_2 & + & x_3 & + & 6x_4 & = & 2
\end{array}
$$

2. We are given the matrix

$$
A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}
$$

(a) Find a 3×3 matrix B which permutes the second and the third column of A. Indicate whether you multiply A by B on the left or on the right.

(b) Find a 3×3 matrix C which adds twice the second row of A to the first row. Indicate whether you multiply A by C on the left or on the right.

(c) Find a 3×3 matrix D which multiplies the third column of A by 5. Indicate whether you multiply A by D on the left or on the right.

3. We are given the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Compute $\det(A)$. Use MATLAB to compute an approximate A^{-1}.

4. We are given the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 91/10 \end{bmatrix}$$

Compute $\det(A)$ and A^{-1}.

5. We are given the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 901/100 \end{bmatrix}$$

Compute $\det(A)$ and A^{-1}.

6. We are given the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9+x \end{bmatrix}$$

Compute $\det(A)$ and A^{-1}. Extra QUESTION: Is A invertible when $x = 0$?