Take home homework 2

Name

MATH 3100.101 Linear Algebra etc USA 19 March 2023

Due date: 27 March 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. If you use MATLAB, give the commands typed in for your answer.

1. Find a basis for the null space and for the range of the matrix

[1	0	0	3]
1	1	0	4
2	0	1	8
1	1	1	6

2. We are given the matrices

$$A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ j & 0 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & k & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(a) Compute AB.

(b) Compute BA.

- (c) Compute AC.
- (d) Compute CA.

3. Find the inverses of the two matrices

$$A = \begin{bmatrix} 1 & 0 & a & 0 \\ 0 & 1 & b & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & c & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & b & c & 1 \end{bmatrix}$$

4. We are given the matrix

$$A = \begin{bmatrix} 1 & x \\ x & 1 \end{bmatrix}$$

(a) Compute the determinant det(A), and compute A^{-1} .

(b) For which real numbers $x \in \mathbb{R}$ is A not invertible?

5. We are given the matrix

$$A = \begin{bmatrix} 1 & x \\ -x & 1 \end{bmatrix}$$

- (a) Compute the determinant det(A), and compute A^{-1} .
- (b) For which real numbers $x \in \mathbb{R}$ is A not invertible?