

Name: _____

MATH 108

Fall 2023

HW 14: Due 12/12

“It is a curious historical fact that modern quantum mechanics began with two quite different mathematical formulations: the differential equation of Schrödinger and the matrix algebra of Heisenberg. The two apparently dissimilar approaches were proved to be mathematically equivalent.”

–Richard Feynman

Problem 1. (10pt) Find the augmented matrix to the corresponding system of equations:

$$x - 2y + 3z - w = 10$$

$$x + 4y - 26w = 19$$

$$-6x + 19z + w = 25$$

Problem 2. (10pt) The matrix below is the initial augmented matrix for a system of linear equations. Find the system of linear equations.

$$\left(\begin{array}{cccc} 5 & -3 & 1 & 8 \\ 1 & 0 & -1 & 5 \\ -6 & 2 & 9 & 1 \\ 5 & 6 & 7 & 12 \end{array} \right)$$

Problem 3. (10pt) The following matrix is the RREF of an augmented matrix coming from a system of equations. Did this system of equations have a solution? If the system of equations had a solution, find all the possible solutions. If the system did not have a solution, explain why.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & -5 \\ 0 & 0 & 0 & 1 & -2 & 7 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Problem 4. (10pt) The following matrix is the RREF of an augmented matrix coming from a system of equations. Did this system of equations have a solution? If the system of equations had a solution, find all the possible solutions. If the system did not have a solution, explain why.

$$\begin{pmatrix} 1 & 0 & -9 \\ 0 & 1 & 0 \end{pmatrix}$$

Problem 5. (10pt) The following matrix is the ‘RREF’ of an augmented matrix coming from a system of equations. Did this system of equations have a solution? If the system of equations had a solution, find all the possible solutions. If the system did not have a solution, explain why.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 & 5 \end{pmatrix}$$