Worksheet 2

Sections 2017 and 219
MATH 54

Jan 24, 2018

Exercise 1. The following three matrices are already in row echelon form. Which represent a consistent system of equations? How many solutions does each system have?

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

Exercise 2. Put the following in row echelon form.

$$\begin{bmatrix} 1 & 4 & 0 & 7 \\ 2 & 7 & 0 & 10 \end{bmatrix} \qquad \begin{bmatrix} 1 & -7 & 0 & 6 & 5 \\ 0 & 0 & 1 & -2 & -3 \\ -1 & 7 & -4 & 2 & 7 \end{bmatrix}$$

Then put each into reduced echelon form and describe the solution set.

Exercise 3. Describe the possible echelon forms of a nonzero 3×2 matrix. Use the symbols $\square$, $*$, and 0, where $\square$ means a nonzero number and $*$ means any number.

Exercise 4. Find h, k such that the system below has: (a) no solutions, (b) a unique solution, and (c) infinitely many solutions.

$$x + hy = 2$$

$$4x + 8y = k$$

Exercise 5. Suppose the coefficient matrix of a system of linear equations has a pivot position in every row. Explain why the system is consistent.

Exercise 6. A system of linear equations with more equations than unknowns is sometimes called *overdetermined*. Can such a system be consistent? Illustrate your answer with a specific system of 3 equations and 2 unknowns. (It may be helpful to draw a picture in the plane!)