Your name:

Instructor (please circle): Samantha Allen Angelica Babei

Math 22 Fall 2018 Homework 2, due Fri Sept 28 4:00 pm in homework boxes in front of Kemeny 108 *Please show your work, and check your answers. No credit is given for solutions without work or justification.*

(1) Consider the homogeneous system of equations

$$\begin{aligned} x_1 + 3x_2 - 5x_3 &= 0 \\ x_1 + 4x_2 - 8x_3 &= 0 \\ -3x_1 - 7x_2 + 9x_3 &= 0. \end{aligned}$$

(a) Write a vector equation that is equivalent to the given system.
(b) Does the system have a nontrivial solution? Justify your answer.

(2) True or false (no working needed, just circle the answer):

(a) T / F: If $A\mathbf{x} = \mathbf{0}$ has infinitely many solutions then $A\mathbf{x} = \mathbf{b}$ cannot have a unique solution, no matter what choice you make for $\mathbf{b}$.

(b) T / F: If 3 vectors in $\mathbb{R}^3$ lie in the same plane then they are linearly dependent.

(c) T / F: If a set of vectors in $\mathbb{R}^4$ is linearly independent, then there are at least 4 vectors in the set.

(d) T / F: The equation $A\mathbf{x} = \mathbf{b}$ is homogeneous if the zero vector is a solution.

(e) T / F: If $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$, and $\mathbf{v}_4$ are in $\mathbb{R}^4$ and $\mathbf{v}_3$ is *not* a linear combination of $\mathbf{v}_1, \mathbf{v}_2$, and $\mathbf{v}_4$, then $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4\}$ is linearly independent.

(3) Consider the following vectors

$$\mathbf{u} = \begin{bmatrix} 2 \\ -4 \\ 1 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} -6 \\ 7 \\ -3 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} 8 \\ h \\ 4 \end{bmatrix}$$

(a) Are $\mathbf{u}$ and $\mathbf{v}$ linearly independent? If not, give the dependence relation.

(b) For which value(s) of h are the vectors $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ linearly *dependent*?