Your name:

Instructor (please circle): Samantha Allen Angelica Babei

Math 22 Fall 2018 Homework 5, due Fri Oct 19 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) In this exercise, let $W \subset \mathbb{R}^3$ be the set of all vectors of the form shown, where a, b, c represent arbitrary real numbers. In each case, determine if W is a subspace of $\mathbb{R}^3$. If yes, find a set S of vectors that spans W. If not, find a property of subspaces that W does not satisfy, and show why W does not satisfy it.

(a) $\begin{bmatrix} a-b \\ b+2 \\ -2a \end{bmatrix}$

(b) $\begin{bmatrix} a-b \\ 3b-2c \\ 2a+3c \end{bmatrix}$

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

(a) T / F: The set $M_{2\times 3}$ of 2×3 matrices with real entries is a vector space.

(b) T / F: $\mathbb{R}^2$ is a subspace of $\mathbb{R}^3$.

(c) T / F: If A is invertible, its columns form a basis for Col$A$.

(d) T / F: If A is invertible, Nul$A = \{\mathbf{0}\}$.

(e) T / F: Any nonempty subset of a basis is linearly independent.

(3) Consider the matrix

$$B = \begin{bmatrix} 2 & 4 & 2 & 13 & 2 \\ 1 & 2 & 0 & 4 & -2 \\ 2 & 4 & -1 & 8 & -2 \\ 1 & 2 & -1 & 3 & -2 \end{bmatrix}.$$

(a) Compute a basis for Nul$B$, which is a subspace of $\mathbb{R}^5$.

(b) Compute a basis for Col$B$, which is a subspace of $\mathbb{R}^4$.