Assignment 5 (Final Version)

Due Monday in Class

1. Section 1.3, Exercise 14.

2. Section 1.3, Exercise 21.

3. Section 1.3, Exercise 26.

4. Section **1.4**, Exercise 12.

5. Section 1.4, Exercise 14. Show your work.

6. Section 1.4, Exercise 16. Ignore the instructions; instead, describe the set of all $\mathbf{b}$ for which $A\mathbf{x} = \mathbf{b}$ has a solution. (Your description should be in the form of an equation involving b_1, b_2, and b_3). Also, give a specific example of a $\mathbf{b}$ for which $A\mathbf{x} = \mathbf{b}$ does not have a solution, along with a few words of explanation.

7. Find the value(s) of h for which $\mathbf{v} = \begin{bmatrix} -3 \\ h \\ -5 \\ 5 \end{bmatrix}$ is in Span $\left\{ \begin{bmatrix} -3 \\ -4 \\ 5 \\ -5 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ -4 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ -3 \end{bmatrix} \right\}$.

Show your work.

8. Section 1.4, Exercise 22. Show your work/explain your reasoning.

9. Section 1.4, Exercise 18. The instructions and the matrix B are located above Exercise 17. Justify your answer using an appropriate theorem.

10. This question is designed to make you think about pivot positions in the rows and/or columns of a (coefficient) matrix A.

(*a*) Suppose A is a 4×4 matrix and $\mathbf{b} \in \mathbb{R}^4$ is a vector such that $A\mathbf{x} = \mathbf{b}$ has a unique solution. Does the equation $A\mathbf{x} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$ have a solution? If so, is the solution unique? Prove your answer very clearly, justifying your assertions very carefully.

(*b*) Suppose A is a 4×3 matrix and $\mathbf{b} \in \mathbb{R}^4$ is a vector such that $A\mathbf{x} = \mathbf{b}$ has a unique solution. Does the equation $A\mathbf{x} = \mathbf{c}$ have a solution for *all* $\mathbf{c} \in \mathbb{R}^4$? Prove your answer very clearly, justifying your assertions very carefully. Use an appropriate theorem.

11. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 9 & 15 \\ 2 & 5 & h \end{bmatrix}$ For what values of h do the columns of A span $\mathbb{R}^3$? Be sure to show your work and justify your answer with an appropriate theorem.