Instructions: Print out this page, and write directly on it, using the back if necessary. Do not staple. This is due under my office door Tuesday May 21st by 5PM. Come see me in Monday office hours if you have questions. You do not need to answer questions in the footnotes.

Problem 1. Which of the following are vector spaces? Why or why not? If it is a vector space, give a basis.

(a) Everywhere you can get on just the magic carpet from Project 2.

(b) Everywhere you can get on the magic carpet, hoover board, and flying unicorn from Project 3.

(c) \( \{ p(t) = at^2 + bt + c | p(0) = 1 \} \)

(d) A matrix, \( A \) is antisymmetric if \( A^T = -A \). Is the set \( S \) of antisymmetric matrices a vector space?
\[
S = \{ A \in M_{2 \times 2} | A^T = -A \}
\]

(e) The set of colors what can be displayed by a computer using the RPG color model.

(f) The solution set (find it) to the following system of linear equations:
\[
\begin{align*}
3x_1 &+ 2x_2 &+ 3x_3 &+ 4x_4 &= 0 \\
2x_1 &+ 4x_2 &+ 6x_3 &+ 7x_4 &= 0
\end{align*}
\]

1How would this problem be different if we change the condition to \( p(1) = 0 \)?

2This question was on an exam in 2011. A similar question that was also on an exam that year, if you want more practice, is “What about the set of symmetric matrices where \( A^T = A \)? What about the set of upper triangular \( 2 \times 2 \) matrices? Do the matrices with determinant 0 form a vector space? What about determinant 1?"

3How would this be different if the right hand side of each equation were equal to 1?