Linear Algebra (MATH 3333 - 04) Spring 2011
Homework 7

Due: Fri. Apr. 1, start of class

Instructions: Please read the homework policies and guidelines posted on the course webpage. You may **not** use a calculator (or computer). Make sure to write your name, course and section numbers in the top right corner of your solution set, as well as the assignment number on top. Please staple your homework. Sections and exercises refer to the exercises in the required course text.

Reading

Sections 4.3 and 4.4.

Conceptual Questions (not to be turned in)

1. What is the relationship between span, linear independence and bases?

Written Assignment

Total: 100 points

Each problem is worth 10 points.

Notation: P_k is the vector space of polynomials of degree $\leq k$.

Section 4.5: 14(a)(d), 15(a)(b), 18, 19, 23

Section 4.6: 2, 4 (no justification needed—for these problems only)

Problem A. Find a basis for the subspace of $\mathbb{R}^3$ defined by $x + y - z = 0$. (Prove it is a basis.)

Problem B. Find two different bases for $\mathbb{R}^3$ containing $v_1 = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$ and $v_2 = \begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$. (Prove they are bases.)

Problem C. (i) Let $S \subseteq \mathbb{R}^3$. Show if $\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \in S$, then S is linearly dependent.

(ii) Can you find two nonzero vectors v_1 and v_2 in $\mathbb{R}^3$ such that no basis of $\mathbb{R}^3$ contains both v_1 and v_2?