Homework Assignment #4

(NYC Summer 2006)

Show all your work!

[marks]

[5] 1. Let $V = \{$☺$\}$

with addition defined: ☺ $+$ ☺ $=$ ☺

and scalar multiplication defined: k☺ $=$ ☺ for all $k \in \mathbb{R}$.

Prove that V is a vector space by verifying *all ten* axioms. (You must explicitly show each one; it is not enough to simply say "It's obvious!")

[6] 2. In each case, find the solution space of $A\vec{x} = \vec{0}$.

(a) $A = \begin{bmatrix} 2 & -5 & 8 \\ -2 & -7 & 1 \\ 4 & 2 & 7 \end{bmatrix}$

(b) $B = \begin{bmatrix} 3 & 1 & -2 \\ -9 & -3 & 6 \\ 12 & 4 & -8 \end{bmatrix}$

(c) $C = \begin{bmatrix} 4 & -2 & 6 \\ 1 & 0 & 2 \\ -3 & -1 & 4 \end{bmatrix}$

[3] 3. Find an equation for the plane spanned by $\vec{u} = (2, 3, -1)$ and $\vec{v} = (1, 2, 2)$.

[4] 4. Express each of the following vectors as a linear combination of the vectors $\vec{u} = (0, 1, 1)$ and $\vec{v} = (3, 2, 1)$, or prove that it's impossible.

(a) $\vec{a} = (2, 2, 2)$

(b) $\vec{b} = (-6, 1, 3)$