110.201 Linear Algebra
2nd Quiz

February 10, 2005

Problem 1   Consider the vector $\vec{v} = \begin{bmatrix} 6 \\ 2 \\ 3 \end{bmatrix}$ in $\mathbb{R}^3$

1. Determine the equation of the line L through the origin and parallel to $\vec{v}$.

2. Consider the vector $\vec{w} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$ in $\mathbb{R}^3$ and find $proj_L(\vec{w})$.

Problem 2   Is the following matrix invertible?

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & -1 & 3 \\ -1 & 0 & 1 \end{bmatrix}$$

Justify your answer. If A^{-1} exists, find it.

Problem 3* Given the linear subspace V of $\mathbb{R}^3$ defined by the equation $2x - y + z = 0$

$$V = \{(x, y, z) \in \mathbb{R}^3 \mid 2x - y + z = 0\}$$

find matrices A and B (and corresponding linear transformations T_A and T_B) such that

1. $\text{Ker}(T_A) = V$

2. $\text{Image}(T_B) = V$.