

Name: _____

1. (10 pts.) Let $A = \begin{bmatrix} 1 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$. Find all solutions to $Ax = b$. Describe and sketch the solution set.
2. (10 pts.) Let $T: \mathbf{R}^2 \rightarrow \mathbf{R}^2$ be the orthogonal projection to the line $x = 2y$. Find the matrix A such that $T(x) = Ax$ for all x .
3. (10 pts.) Give an example of a 3×2 matrix A and a vector b such that $Ax = b$ has a unique solution.
4. (10 pts.) Suppose A is a 3×2 matrix and $Ax = 0$ has the unique zero solution. What can you say about the number of solutions of $Ax = b$ for an arbitrary vector b ?
5. (10 pts.) Find all linear maps $T: \mathbf{R}^2 \rightarrow \mathbf{R}^2$ such that $T \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $T \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$.

1	2	3	4	5	total (50)	%