Midterm 1 / 2002.10.16 / Linear Algebra / MAT 2233.001

Name: _____

Please show all work.

1. (10 pts.) Let $A = \begin{bmatrix} 2 & -6 & -2 \\ -1 & 3 & -3 \end{bmatrix}$ and $b = \begin{bmatrix} -2 \\ -7 \end{bmatrix}$.
   (a) Find all solutions to $Ax = b$.
   (b) Describe and sketch the solution set.

2. (10 pts.) Let $T: \mathbf{R}^2 \to \mathbf{R}^2$ be the orthogonal projection to the line $x = -4y$.
   (a) Find the matrix A such that $T(x) = Ax$ for all x.
   (b) Describe and sketch the image and the kernel of T. Is T 1-1? Onto? Explain.

3. (10 pts.) Suppose $A \neq 0$. What are all the possibilities for the number of solutions to the linear system $Ax = b$ if A is 2×1? If A is 1×2? Justify your answers.

4. (10 pts.)
   Suppose $T: \mathbf{R}^2 \to \mathbf{R}^3$ is a linear map such that $T \begin{bmatrix} 2 \\ -7 \end{bmatrix} = \begin{bmatrix} 6 \\ -12 \\ -7 \end{bmatrix}$ and $T \begin{bmatrix} -1 \\ 3 \end{bmatrix} = \begin{bmatrix} -3 \\ 5 \\ 3 \end{bmatrix}$.
   (a) Find the matrix for T.
   (b) Describe and sketch the image and the kernel of T. Is T 1-1? Onto? Explain.

1	2	3	4	total (40)
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Prelim. course grade: %