Short Assignment 7: Due Wednesday, February 17

These are some quick problems to make sure you have understood linear transformations.

1. Determine whether each of the following transformations is linear:

(*a*) $T : \mathbb{R}^3 \to \mathbb{R}^2$ by $T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} x_1^2 \\ x_3 \end{bmatrix}$.

(*b*) $T : \mathbb{R}^2 \to \mathbb{R}^3$ by $T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_2 \\ x_1 \\ x_1 + 2x_2 \end{bmatrix}$.

2. Note: If any of these problems require row-reducing a matrix, you may use Maple or some other such program to do the calculation. You should give the original matrix and the reduced matrix. Section 1.8, Exercises 6, 10, and 12. Note that in each case, the transformation T is defined by $T(\mathbf{x}) = A\mathbf{x}$, for some given matrix A. Thus, "find a vector $\mathbf{x}$ whose image under T is $\mathbf{b}$" is the same as "find a solution to the matrix equation $A\mathbf{x} = \mathbf{b}$." Likewise, "find all $x \in \mathbb{R}^4$ that are mapped into the zero vector by the transformation" is the same as "find all $x \in \mathbb{R}^4$ suchthat $A\mathbf{x} = \mathbf{0}$."

3. Close reading. Section 1.8, Exercise 22. True/False: Each question is answered in Section 1.8. Give the page and the rough location, e.g., "True: Page 63, near top."

4. Section **1.9**, Exercises 18 and 20. Determine the matrices of these two linear transformations. (The vectors are written as row vectors to save space, so translate everything to the usual column format.