Math 1553 Worksheet §§2.4, 2.5

For problems 1 and 2 below: The professor in your widgets and gizmos class is trying to decide between three different grading schemes for computing your final course grade. The schemes are based on homework (HW), quiz grades (Q), midterms (M), and a final exam (F). The three schemes can be described by the following matrix A:

$$
\begin{array}{c c}
 & \begin{array}{cccc} \text{HW} & \text{Q} & \text{M} & \text{F} \end{array} \\
\begin{array}{c} \text{Scheme 1} \\ \text{Scheme 2} \\ \text{Scheme 3} \end{array} &
\left(\begin{array}{cccc}
0.1 & 0.1 & 0.5 & 0.3 \\
0.1 & 0.1 & 0.4 & 0.4 \\
0.1 & 0.1 & 0.6 & 0.2
\end{array} \right)
\end{array}
$$

Feel free to use a calculator to carry out arithmetic in problems 1 and 2.

1. Suppose that you have a score of x_1 on homework, x_2 on quizzes, x_3 on midterms, and x_4 on the final, with potential final course grades of b_1, b_2, b_3. Write a matrix equation $Ax = b$ to relate your final grades to your scores.

2. Suppose that you end up with averages of 90% on the homework, 90% on quizzes, 85% on midterms, and a 95% score on the final exam. Use Problem 1 to determine which grading scheme leaves you with the highest overall course grade.

3.   **a)** True or false. Justify your answer:
If A is a 5×4 matrix, then the equation $Ax = b$ must be inconsistent for some b in $\mathbf{R}^5$.

TRUE   **FALSE**

b) Suppose $A = \begin{pmatrix} v_1 & v_2 & v_3 \end{pmatrix}$ and $A \begin{pmatrix} -3 \\ 2 \\ 7 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$. Must it be true that $\{v_1, v_2, v_3\}$ is linearly dependent? If so, write a linear dependence relation for the vectors.

4.   Find the solution sets of $x_1 - 3x_2 + 5x_3 = 0$ and $x_1 - 3x_2 + 5x_3 = 3$ and write them in parametric vector form. How do the solution sets compare geometrically?