

### Math 1553 Worksheet §§2.3-2.5

For problem 1 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  $A$ :

$$\begin{array}{l} \text{Scheme 1} \\ \text{Scheme 2} \\ \text{Scheme 3} \end{array} \begin{pmatrix} \text{HW} & \text{Q} & \text{M} & \text{F} \\ 0.1 & 0.1 & 0.5 & 0.3 \\ 0.1 & 0.1 & 0.4 & 0.4 \\ 0.1 & 0.1 & 0.6 & 0.2 \end{pmatrix}$$

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. Determine whether the statement is true or false. Justify your answer.  
If  $A$  is a  $5 \times 4$  matrix, then the equation  $Ax = b$  must be inconsistent for some  $b$  in  $\mathbf{R}^5$ .

TRUE

FALSE

3. Suppose  $A = (v_1 \ v_2 \ v_3)$  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. If not, explain why not.

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?