

## Linear Algebra 2270-2

Due in Week 3

The third week completes work from sections 1.4 and 1.5. Here's the list of problems, followed by problem notes and a few answers.

**Section 1.4.** Exercises 6, 8, 17, 23, 27, 31, 32.

**Section 1.5.** Exercises 7, 8, 10, 29, 31, 33, 35.

### Some Answers and Hints

Exercise 1.4-6: On the left side of the given matrix equation  $A\vec{x} = \vec{b}$ , use the entries  $-2$ ,  $-5$  in the vector  $\vec{x}$  as the weights in a linear combination of the columns of the matrix  $A$ .

Exercise 1.4-8: The answer is a matrix equation  $A\vec{x} = \vec{b}$ , for which  $A$ ,  $\vec{x}$ ,  $\vec{b}$  are given explicit definitions. The left side of the given vector equation is a linear combination of four vectors. Write the matrix  $A$  whose columns are those four vectors, and create a variable vector  $\vec{z}$  with four entries  $z_1, z_2, z_3, z_4$ . The vector  $\vec{b}$  is the column vector on the right side of the given vector equation.

Exercise 1.4-32: A set of three vectors in  $\mathcal{R}^4$  cannot span  $\mathcal{R}^4$ . Reason: the matrix  $A$  whose columns are these three vectors has four rows. To have a pivot in each row,  $A$  would have to have at least four columns (one for each pivot), which is not the case. Since  $A$  does not have a pivot in every row, its columns do not span  $\mathcal{R}^4$ , by Theorem 4. In general, a set of  $n$  vectors in  $\mathcal{R}^m$  cannot span  $\mathcal{R}^m$  when  $n$  is less than  $m$ .