Linear Algebra
C Term, Sections C01-C04
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Linear Algebra Assignment 2

DUE DATE: Wednesday, January 23, noon. Deliver to your conference PLA.

N.B. No late assignments will be accepted for credit.

N.B. Keep in mind Professor Martin's rules for completing assignments (reproduced on the back of this sheet).

Please complete the following four problems:

1. (SIMPLE EXAMPLE OF A LINEAR PROGRAMMING PROBLEM)

   (a) The Blind Melon Widget company produces three models, P_1, P_2 and P_3, of widget in its Worcester manufacturing facility. Each of these is made of steel and plastic. Each unit of model P_1 requires one unit each of steel and plastic. Each unit of P_2 requires two units of steel and one unit of plastic. Each unit of P_3 requires two units of steel and three units of plastic. If, on a particular day, 1200 units of steel and 1000 units of plastic are available for production, determine all possible production schedules which fully utilize the resources.

   (b) Suppose now that Blind Melon makes a profit of \$12 on each unit of model P_1 it produces, a profit of \$22 on each unit of P_2 and \$30 on each unit of P_3. Among the solutions found in part (a), which production schedule will maximize profit? Display your decision in a table, showing how much of each resource will be devoted to each model as well.

2. **(a)** Find all values of r for which the matrix

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & r & 2 \\ 0 & 2 & r \end{pmatrix}$$

   is singular.

   (b) For all other values of r, compute A^{-1}. Show the steps in your row reduction. (HINT: *In your answer, r will appear in some entries; i.e., the matrix A^{-1} is a function of r.*)

3. (Cf. Exercise #27 on page 89)

   (a) Find a square root of the matrix

$$A = \begin{pmatrix} 1 & 9 \\ 0 & 1 \end{pmatrix}.$$

   (b) Find a square root of the matrix

$$A = \begin{pmatrix} 1 & 4 & 14 \\ 0 & 1 & 8 \\ 0 & 0 & 1 \end{pmatrix}.$$

   (a) Find three different square roots of the 3×3 identity matrix.

4. Do problem T.13 on page 65.

PROFESSOR MARTIN'S RULES FOR LINEAR ALGEBRA ASSIGNMENTS:

- Write neatly, using correct English.
- Use **only one side** of each sheet of paper. Ink on the back of the page deteriorates the readability of what is on the front.
- Explain your steps. A correct answer with no explanation will earn a grade of zero.
- Use a staple when you submit more than one sheet and want them all back. There is a stapler for public use in the Mathematical Sciences Department Office (SH108).