MATH122 200610 Problem Set 1

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The following problems from the exercises in section 1.1 may appear on the quiz on January 25.

1. (Based on 1.1.2 and 1.1.12) Solve each of the following systems by using elementary row operations on the equations or on the augmented matrix. Follow the systematic elimination procedure described in the textbook.

   (a)

   $$\begin{aligned} 2x_1 + 4x_2 &= -4 \\ 5x_1 + 7x_2 &= 11. \end{aligned}$$

   (b)

   $$\begin{aligned} x_1 - 3x_2 + 4x_3 &= -4 \\ 3x_1 - 7x_2 + 7x_3 &= -8 \\ -4x_1 + 6x_2 - x_3 &= 7. \end{aligned}$$

2. (Based on 1.1.10) Use row operations to reduce the augmented matrix below and then describe the solution set of the system described by the matrix.

   $$\left[\begin{array}{cccc|c} 1 & -2 & 0 & 3 & -2 \\ 0 & 1 & 0 & -4 & 7 \\ 0 & 0 & 1 & 0 & 6 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right].$$

3. (Based on 1.1.20) Determine the value(s) of h such that the matrix is the augmented matrix of a consistent linear system.

   $$\left[\begin{array}{cc|c} 1 & h & -3 \\ -2 & 4 & 6 \end{array}\right]$$

4. (Based on 1.1.26) Construct three different augmented matrices for linear systems the solution set of which is $x_1 = -2$, $x_2 = 1$, and $x_3 = 0$.

5. (Based on 1.1.28) Suppose a, b, c, and d are constants such that a is not 0 and the system below is consistent for all possible values of f and g. What can you say about the numbers a, b, c, and d?

   $$\begin{aligned} ax_1 + bx_2 &= f \\ cx_1 + dx_2 &= g. \end{aligned}$$

Other problems which will help you learn the material can be found in section 1.1, practice problems 1–4 and exercises 1–24 and 29–32 (try the odd numbers first). Students who would like obtain an A in the course should also try exercises 25 and 27.