MA 162: Finite Mathematics - Section 2.2

Fall 2014

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September 10, 2014

Announcements:

- Alternate Exam Request Form due Monday
- Homework 2.1 due Friday at 6pm.
- Homework 2.2 due next Tuesday at 6pm.

2.2 - The Method of Elimination

- Last time we showed how to use the method of elimination and the method of substitution to solve a system of two linear equations in two variables.
- The method of substitution gets more difficult as the number of variables increases.
- The method of elimination is better than substitution as the number of variables increases.

2.2 - The Method of Elimination

- We want each step of elimination to produce an equivalent system; that is, a system with the same solutions as the previous system. To do this we are allowed to use three different operations:

  1. Interchange two equations.
  2. Replace an equation by a non-zero constant multiple of itself.
  3. Replace an equation by the sum of that equation and a constant multiple of any other equation.

- The order we apply these operations matters. We should be making the system easier to solve as we progress.

Tan, Section 2.2, Problem 55

Solve the system of equations:

$$\begin{array}{rcrcrcr} x & - & y & + & 3z & = & 14 \\ x & + & y & + & z & = & 6 \\ -2x & - & y & + & z & = & -4 \end{array}$$

Tan, Section 2.2, Problem 45 - Augmented Matrices

Find the solution to the system of equations:

$$\begin{array}{rcrcrcr} 2x & + & y & - & 2z & = & 4 \\ x & + & 3y & - & z & = & -3 \\ 3x & + & 4y & - & z & = & 7 \end{array}$$

Use an augmented matrix to save space. Make sure you clearly label your row operations so I don't have to guess what you're doing. You will be penalized on quizzes and exams if you don't label your row operations.

2.2 - Row-Reduced Form of a Matrix

An augmented matrix is said to be in **row-reduced form** if it satisfies the following conditions:

1. Each row consisting entirely of zeros lies below all rows having non-zero entries.
2. The first non-zero entry in each (non-zero) row is 1 (called a leading 1).
3. In any two successive (non-zero) rows, the leading 1 in the lower row lies to the right of the leading 1 in the upper row.
4. If a column in the coefficient matrix contains a leading 1, then the other entries in that column are zeros.

Tan, Section 2.2, Problem 63

The total number of passengers riding a certain city bus during the morning shift is 1000. If the child's fare is \$0.50, the adult fare is \$1.50, and the total revenue from the fares in the morning shift is \$1300, how many children and how many adults rode the bus during the morning shift?

Solution: Yesterday we setup the following system to describe this situation:

$$\begin{array}{rcrcl} x & + & y & = & 1000 \\ .5x & + & 1.5y & = & 1300 \end{array}$$

where x is the number of children riding the bus and y is the number of adults.

Tan, Section 2.2, Problem 67

The annual returns on Sid Carrington's three investments amounted to $\$21,600$: 6% on a savings account, 8% on mutual funds, and 12% on bonds. The amount of Sid's investment in bonds was twice the amount of his investment in the savings account, and the interest earned from his investment in bonds was equal to the dividends he received from his investment in mutual funds. Find how much money he placed in each type of investment.

Tan, Section 2.2, Problem 64 (if time)

Cantwell Associates, a real estate developer, is planning to build a new apartment complex consisting of one-bedroom units and two- and three-bedroom townhouses. A total of 192 units is planned, and the number of family units (two- and three-bedroom townhouses) will equal the number of one-bedroom units. If the number of one-bedroom units will be 3 times the number of three-bedroom units, find how many units of each type will be in the complex.