MFADMAT – QUIZ No. 1

Problem Solving. Box your final answer.

1. Solve the ff. system of linear equations using ***ref***. Additional bonus if you will be able to make it to ***rref***.
   a. $4x_1 - 2x_2 + 3x_3 = 1$
      $x_1 + 3x_2 - 4x_3 = -7$
      $3x_1 + x_2 + 2x_3 = 5$

   b. $x_1 - 2x_2 + 3x_3 = 7$
      $2x_1 + x_2 + x_3 = 4$
      $-3x_1 + 2x_2 - 2x_3 = -10$

   c. $2x_1 + 3x_2 - 4x_3 + x_4 = 9$
      $x_1 - 3x_2 + x_3 - x_4 = 5$
      $-2x_1 - 4x_2 - 3x_3 + x_4 = -11$
      $x_1 + x_2 + x_3 - 3x_4 = -4$

2. Write the solution set in parametric vector form.
   a. $x_1 + 3x_2 - 3x_3 = 7$
      $x_2 - 4x_3 = 5$

   b. $x_1 - 3x_2 - 8x_3 = 5$
      $x_2 + 2x_3 = -4$

   c. $x_1 + 2x_2 - 3x_3 = 5$
      $2x_1 + x_2 - 3x_3 = 13$

   d. $-3x_1 + x_2 = -8$
      $5x_2 - x_3 = 2$

3. Balance: Boron sulfide reacts violently with H_2O to form boric acid and hydrogen sulfide gas.

$$x_1B_2S_3 + x_2H_2O \rightarrow x_3H_3BO_3 + x_4H_2S$$

4. Balance: Limestone neutralizes the acid in acid rain:

$$x_1H_3O + x_2CaCO_3 \rightarrow x_3H_2O + x_4Ca + x_5CO_2$$

5. Suppose an economy has 3 sectors: Agriculture, Mining and Manufacturing. Agriculture sells 5% of its output to Mining, 30% to Manufacturing and retains the rest. Mining sells 20% of its output to Agriculture, 70% to Manufacturing and retains the rest. Manufacturing sells 20% of its output to Agriculture, 30% to Mining and retains the rest.
   a. Construct the exchange table for this economy.
   b. Find a set of equilibrium prices for the economy.

Bonus: Reduce the ff. linear systems in their *rref*.

a) $\begin{bmatrix} 1 & 2 & 4 & 8 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 9 & 12 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 2 & 4 & 5 \\ 2 & 4 & 5 & 4 \\ 4 & 5 & 4 & 2 \end{bmatrix}$