Howard University Math Department

2/3/2012 **College Algebra II Quiz 3** **Spring 2012**

Instructions:
PLEASE PROVIDE STEP BY STEP EXPLANATIONS
WRITING ONLY ANSWERS WILL NOT GET FULL CREDIT
Time Limit 30 minutes
Please read the questions carefully before answering
Each problem 10 points.
Challenge problem is extra credit 10 points.

1. Solve using elimination method:

$$2x + 3y = 5 \quad (1)$$
$$3x + y = 4 \quad (2)$$

Solution:

$$\begin{aligned} 3 \times (1): \ 6x + 9y &= 15 \\ 2 \times (2): \ 6x + 2y &= 8 \\ \text{on subtracting:} \ 7y &= 7 \end{aligned}$$

This gives $y = 1$. Plugging this into either equation we can get x.

Let us put $y = 1$ in (1). We get $2x + 3 = 5$. This gives $x = 1$.

Check in original system to see that $x = 1, y = 1$ satisfies both equations.

You can also do this by subtracting $3 \times (2)$ from (1).

2. Solve the system, or show that it has no solution:

$$x - 2y = 5 \quad (3)$$
$$-2x + 4y = 1 \quad (4)$$

Solution:

$2 \times (3) + (4)$ gives $0 = 11$ which is impossible. So there are no solutions.

3. Jay uses a total of 1000 dollars to buy stocks in two different companies, one of which makes cars and the other makes bikes. The car company gives a 5% return per year and the bike company gives 8% return per year. After one year he wants 7% return. How much should he invest in each?

   Solution:

   Let x be the amount invested in cars and y the amount invested in bikes. We get two equations:

$$x + y = 1000 \tag{5}$$
$$.05x + .08y = .07(1000) \tag{6}$$

   Multiplying (6) by 100 to simplify things we get the new system as:

$$x + y = 1000 \tag{7}$$
$$5x + 8y = 7000 \tag{8}$$

   Solving this by substitution, we get $y = 1000 - x$ from (7) and put that in (8) to get $5x + 8(1000 - x) = 7000$. Simplifying, we get $5x - 8x = 7000 - 8000$. This gives $-3x = -1000$. Thus $x = 333.33$. Then $y = 666.67$.

   Check this into both equations to see that it satisfies them.

4. Find the complete solution of the linear system, or show that it is inconsistent. (If the system has infinitely many solutions, express your answer in terms of t, where $x = x(t), y = y(t)$, and $z = t$. If there is no solution, say that there is no solution).

$$x + 2y + z = 1 \tag{9}$$
$$x - y + z = 4 \tag{10}$$
$$2x + y = 0 \tag{11}$$

   Solution:

   Using substitution:

   From (11) we get $y = -2x$.

   Plugging this into (10) we get $x + 2x + z = 4$ which gives $3x + z = 4$.

   Plugging this into (9) we get $x - 4x + z = 1$ i.e, $-3x + z = 1$.

   Adding these two equations we cancel out x and get $2z = 5$ which means $z = 2.5$.

   Putting $z = 2.5$ in $3x + z = 4$ we get $3x = 1.5$ or $x = 0.5$.

   Putting $x = 0.5$ in $y = -2x$ we get $y = -1$.

   Verify that these values of x, y, z satisfy all the 3 equations (9),(10) and (11).

5. (Challenge) Express the following as an equation. You do not need to solve it:

   John and Karla have been married for 30 years. They have 3 children. The oldest child was born 3 years before they had their second child. When the second child was 5 years old the youngest one was born. The oldest child is twice as old as the youngest. Write 3 equations involving x, y, z representing the ages of their 3 children.

   Solution: Let x be the age of the oldest, y and z the ages of the second and third child respectively.

$$x - y = 3 \tag{12}$$
$$y - z = 5 \tag{13}$$
$$x - 2z = 0. \tag{14}$$

   the last equation is same as $x = 2z$.