Name:______________________________ Recitation Section:__________

Math 1553 Quiz 1: lines and planes and 1.1 (10 points, 10 minutes)

Solutions

1. (1 point each) In each case, determine whether the given equation in x, y, and z is linear or non-linear. Circle your answer.

a) $7x - \pi y = 2^{3/2}z$ [✓ LINEAR] NON-LINEAR

b) $x + y + \frac{z}{3} = 0$ [✓ LINEAR] NON-LINEAR

2. (1 point each) True or False. Circle TRUE if the statement is always true. Otherwise, circle FALSE.

a) If a system of linear equations has two equations and three variables, then it must have at least one solution. TRUE [✓ FALSE]

b) If a system of linear equations has three equations and two variables, then it must be inconsistent. TRUE [✓ FALSE]

Part (a) is false for the exact same reason #5 on 1.1's Webwork was false (the system can be inconsistent).
You actually show that part (b) is false in the first part of #6 on the 1.1's Webwork.

3. (3 points) Write a system of two linear equations in the variables x_1 and x_2 that is *inconsistent*. Briefly justify why your system is inconsistent.

Solution. Straight from class and #6 on the 1.1 Webwork. One example is:

$$x_1 - x_2 = 5$$

$$2x_1 - 2x_2 = 6.$$

The system reduces to $0 =$ (some nonzero number), which is impossible.
The student could even choose one equation to be “$0 = 1$" or something analogous.
Geometric reasoning also suffices.

4. (3 points) Find all points (x, y) where the lines given below intersect. Show your work!

$$x - y = 3$$

$$-2x + 4y = -2.$$

Solution.

$$\left(\begin{array}{cc|c} 1 & -1 & 3 \\ -2 & 4 & -2 \end{array}\right) \xrightarrow{R_2=R_2+2R_1} \left(\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 2 & 4 \end{array}\right) \xrightarrow{R_2=\frac{R_2}{2}} \left(\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 1 & 2 \end{array}\right) \xrightarrow{R_1=R_1+R_2} \left(\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & 2 \end{array}\right).$$

So $x = 5$ and $y = 2$. It is fine if the student used basic algebra instead of an augmented matrix.