Please show **all** your work and circle your answer! Please read the questions carefully. You have 15 minutes for this quiz.

Name:_____

1. (8 pts)

   (a) (4pts) Write the following system of linear equations as an augmented matrix.

$$y = \frac{3}{2}x + 2z$$
$$x = 3z - \frac{2}{3}y$$
$$z = \frac{1}{2}y - \frac{3}{2}x$$

   (b) (4 pts) Find the general solution to the above system of linear equations by performing elementary row operations on the augmented matrix you found.

Solution: (a) I wrote this system in a funny way just to confuse you. To write it as an augmented matrix, you need to move all the variables to one side to get:

$$\frac{3}{2}x - y + 2z = 0$$
$$-x - \frac{2}{3}y + 3z = 0$$
$$\frac{-3}{2}x + \frac{1}{2}y - z = 0$$

Then you can convert this into an augmented matrix:

$$\begin{pmatrix} \frac{3}{2} & -1 & 2 & 0 \\ -1 & \frac{-2}{3} & 3 & 0 \\ \frac{-3}{2} & \frac{1}{2} & -1 & 0 \end{pmatrix}$$

(b) Then you solve this using elementary row operations to get:

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

Therefore $x = y = z = 0$. You can plug this in to check.

2. (2 pts) Determine whether the system of equations with the following corresponding augmented matrix has a solution, if it does, write one of the solutions.

$$\begin{pmatrix} 1 & 0 & 1 & 0 & 1 & 3 \\ 4 & 8 & 15 & 16 & 23 & 42 \\ 9 & 4 & 8 & 1 & 1 & 8 \\ 0 & 1 & 0 & 1 & 0 & 2 \\ 2 & 2 & 2 & 2 & 2 & 4 \end{pmatrix}$$

Solution: If you set the first row to be the first row plus the fourth row you will get:

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 5 \\ 4 & 8 & 15 & 16 & 23 & 42 \\ 9 & 4 & 8 & 1 & 1 & 8 \\ 0 & 1 & 0 & 1 & 0 & 2 \\ 2 & 2 & 2 & 2 & 2 & 4 \end{pmatrix}$$

Then take the fifth row and subtract twice the first row to get:

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 5 \\ 4 & 8 & 15 & 16 & 23 & 42 \\ 9 & 4 & 8 & 1 & 1 & 8 \\ 0 & 1 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 0 & 0 & -6 \end{pmatrix}$$

The last equation says that $0 = -6$ therefore this system is inconsistent and has no solution.

The End.