**Algebra 2**
**Unit: Systems of Equations and Inequalities**
**Section: Systems of Equations with Three Variables**

**Flash Cards: Solving Systems of Equations with Three Variables Using Matrices**

Directions: Solve the following systems of equations

1.
$2x + y + z = 7$
$x + y - z = 4$
$x = 3y - z$

2.
$x + y + z = 3$
$-4x = z$
$4x + y - z = -8$

3.
$2x + 3y + z = 21$
$x + y - z = 5$
$x = z$

Answers:

1. A three by three matrix with the first row: 2, 1, 1; the second row: 1, 1, negative 1; and the third row: 1, negative 3, 1; times a three by one matrix with terms x, y, z, equals a three by one matrix with terms 7, 4, 0.
x, y, z equals a three by three matrix with the first row: one-fifth, two-fifths, one-fifth; the second row: one-fifth, negative one-tenth, negative three-tenths; and the third row: two-fifths, negative seven-tenths, negative one-tenth; times a three by one matrix with terms 7, 4, 0, equals a three by one matrix with terms 3, 1, 0.
Solution: (3, 1, 0)

2. A three by three matrix with the first row: 1, 1, 1; the second row: negative 4, 0, negative 1; and the third row: 4, 1, negative 1; times a three by one matrix with terms x, y, z, equals a three by one matrix with terms 3, 0, negative 8.
x, y, z equals a three by three matrix with the first row: negative one-eleventh, negative two-eleventh, one-eleventh; the second row: eight-elevenths, five-elevenths, three-elevenths; and the third row: four-elevenths, negative three-elevenths, negative four-elevenths; times a three by one matrix with terms 3, 0, negative 8, equals a three by one matrix with terms negative 1, 0, 4.
Solution: (-1, 0, 4)

3. A three by three matrix with the first row: 2, 3, 1; the second row: 1, 1, negative 1; and the third row: 1, 0, negative 1; times a three by one matrix with terms x, y, z, equals a three by one matrix with terms 21, 5, 0.

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & -1 & \frac{4}{3} \\ 0 & 1 & -1 \\ \frac{1}{3} & -1 & \frac{1}{3} \end{bmatrix} \begin{bmatrix} 21 \\ 5 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \\ 2 \end{bmatrix}$$

Solution: $(2, 5, 2)$