Notes 36 **Name** _____

8.1, 8.2 (Matrix Solutions to Linear Systems)

Gaussian Elimination

Row-Echelon Form $\left[\begin{array}{cc|c} 1 & a & b & c \\ 0 & 1 & d & e \\ 0 & 0 & 1 & f \end{array}\right]$ $\longrightarrow$ **Back-Order Substitution** $\begin{array}{l} x + ay + bz = c \\ y + dz = e \\ z = f \end{array}$

Gauss-Jordan Elimination

$\left[\begin{array}{ccc|c} 1 & 0 & 0 & a \\ 0 & 1 & 0 & b \\ 0 & 0 & 1 & c \end{array}\right]$ $\longrightarrow$ $\begin{array}{l} x = a \\ y = b \\ z = c \end{array}$

Back-Order Substitution: *Write the linear system and solve using back-order substitution.*

1) $\left[\begin{array}{ccc|c} 1 & 1 & 0 & 3 \\ 0 & 1 & 3/2 & -2 \\ 0 & 0 & 1 & 0 \end{array}\right]$

2) $\left[\begin{array}{cccc|c} 1 & 2 & -1 & 0 & 2 \\ 0 & 1 & 1 & -2 & -3 \\ 0 & 0 & 1 & -1 & -2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

Matrix Operations: *Perform the matrix operation and write the new matrix.*

3) $\left[\begin{array}{ccc|c} 1 & -1 & 5 & -6 \\ 3 & 3 & -1 & 10 \\ 1 & 3 & 2 & 5 \end{array}\right]$ $-3R_1 + R_2$

4) $\left[\begin{array}{ccc|c} 1 & -1 & 5 & -6 \\ 3 & 3 & -1 & 10 \\ 1 & 3 & 2 & 5 \end{array}\right]$ $R_1 - R_3$

Solving Systems Using Matrices: *Use Gaussian elimination with back-substitution or Gauss-Jordan elemination.*

5)
$$3a + b - c = 0$$
$$2a + 3b - 5c = 1$$
$$a - 2b + 3c = -4$$

6)
$$2x + y = z + 1$$
$$2x = 1 + 3y - z$$
$$x + y + z = 4$$

8.2 (Inconsistent and Dependent Systems and Their Applications)

System with No Solutions

Row-Echelon Form $\left[\begin{array}{ccc|c} 1 & a & b & c \\ 0 & 1 & d & e \\ 0 & 0 & 0 & f \end{array}\right] \longrightarrow 0 \neq f$

System with Infinite Many Solutions

$\left[\begin{array}{ccc|c} 1 & a & b & c \\ 0 & 1 & d & e \\ 0 & 0 & 0 & 0 \end{array}\right] \longrightarrow 0 = 0$

Solving Using Gaussian Elimination: *Use Gaussian elimination to find the complete solution to each system of equations, or show that none exist.*

7) $\begin{aligned} x - 2y - z &= -5 \\ 2x - 3y - z &= 0 \\ 3x - 4y - z &= 1 \end{aligned}$

8) $\begin{aligned} x - 2y - z &= 5 \\ 2x - 5y + 3z &= 6 \\ x - 3y + 4z &= 1 \end{aligned}$