

## Chapter 3 Section 2

For # 1 – 3, give the augmented matrix for each system of equations.

$$1. \begin{cases} x + y + z = 6 \\ x - y + z = 2 \\ x + 2y - z = 2 \end{cases}$$

$$2. \begin{cases} x + y + 0.1z = 0.1 \\ x - y + z = 5 \\ x + 2y - z = -3 \end{cases}$$

$$3. \begin{cases} x + y + z = -0.8 \\ x - y + z = 3.2 \\ x + 2y - z = -4.8 \end{cases}$$

For #4 – 6, give the system of equation represented by each augmented matrix. Use the variables x, y, z and w in that order.

$$4. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 3 & 1 & -1 & 2 \\ 1 & 7 & 3 & -1 \end{bmatrix}$$

$$5. \begin{bmatrix} 1 & -1 & 1 & -2 & 1 \\ 2 & -1 & 4 & -3 & 5 \\ -2 & 3 & 0 & 6 & -1 \end{bmatrix}$$

$$6. \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & -2 & -3 \\ -2 & -2 & -1 & -8 \end{bmatrix}$$

# Gauss-Jordan Reduction

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7. Arrange these augmented matrices as they arise in the Gaussian reduction procedure for

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ -2 & -1 & -2 & -5 & 1 \\ 1 & -2 & 2 & 2 & 1 \\ 2 & 4 & 1 & 7 & 3 \end{bmatrix}. \quad \underline{\mathbf{A}}, \underline{\quad}, \underline{\quad}, \underline{\quad}, \underline{\quad}, \underline{\quad}, \underline{\mathbf{a}}$$

$$\text{a. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix} \quad \text{b. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 2 & 3 \\ 0 & 0 & -1 & -1 & -1 \end{bmatrix} \quad \text{c. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 2 & 3 \\ 0 & 2 & -1 & 1 & 1 \end{bmatrix}$$

$$\text{d. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & -3 & 1 & -1 & 0 \\ 0 & 2 & -1 & 1 & 1 \end{bmatrix} \quad \text{e. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & -3 & 1 & -1 & 0 \\ 2 & 4 & 1 & 7 & 3 \end{bmatrix} \quad \text{f. } \begin{bmatrix} 1 & 1 & 1 & 3 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & -2 & 2 & 2 & 1 \\ 2 & 4 & 1 & 7 & 3 \end{bmatrix}$$

8. For solving  $\begin{cases} x & +2y & -z & = 2 \\ 2x & +5y & -4z & = 1 \\ -2x & -2y & -z & = -8 \end{cases}$ , order the following matrices as they would arise in Gauss-

Jordan reduction:  $\underline{\mathbf{f}}$ ,  $\underline{\quad}$ ,  $\underline{\quad}$ ,  $\underline{\quad}$ ,  $\underline{\quad}$ ,  $\underline{\quad}$ ,  $\underline{\quad}$

$$\text{a. } \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & -2 & -3 \\ 0 & 0 & 1 & 2 \end{bmatrix} \quad \text{b. } \begin{bmatrix} 1 & 2 & 0 & 4 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \quad \text{c. } \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & -2 & -3 \\ -2 & -2 & -1 & -8 \end{bmatrix}$$

$$\text{d. } \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \quad \text{e. } \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \quad \text{f. } \begin{bmatrix} 1 & 2 & -1 & 2 \\ 2 & 5 & -4 & 1 \\ -2 & -2 & -1 & -8 \end{bmatrix}$$

$$\text{g. } \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & -2 & -3 \\ 0 & 2 & -3 & -4 \end{bmatrix}$$

9. Do the first step of Gaussian reduction for  $\begin{bmatrix} 1 & 2 & -2 & 3 \\ 3 & 1 & -1 & 2 \\ 2 & 7 & 3 & -1 \end{bmatrix}$

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10. Do the next step of Gaussian reduction for  $\begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & -5 & 5 & -7 \\ 2 & 7 & 3 & -1 \end{bmatrix}$

11. Do the next step of Gaussian reduction for  $\begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & 1 & -1 & 2 \\ 0 & 7 & 3 & -1 \end{bmatrix}$

12. Do the next step of Gaussian reduction for  $\begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & -5 & 5 & -7 \\ -3 & 2 & 1 & -1 \end{bmatrix}$

13. Do the next step of Gaussian reduction for  $\begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & 1 & -1 & 2 \\ 0 & -4 & 3 & -1 \end{bmatrix}$

**Answers:**

1.  $\begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & -1 & 1 & 2 \\ 1 & 2 & -1 & 2 \end{bmatrix}$

2.  $\begin{bmatrix} 1 & 1 & 0.1 & 0.1 \\ 1 & -1 & 1 & 5 \\ 1 & 2 & -1 & -3 \end{bmatrix}$

3.  $\begin{bmatrix} 1 & 1 & 1 & -0.8 \\ 1 & -1 & 1 & 3.2 \\ 1 & 2 & -1 & -4.8 \end{bmatrix}$

4.  $\begin{cases} x + 2y - 2z = 3 \\ 3x + y - z = 2 \\ x + 7y + 3z = -1 \end{cases}$

5.  $\begin{cases} x - y + z - 2w = 1 \\ 2x - y + 4z - 3w = 5 \\ -2x + 3y + 6w = -1 \end{cases}$

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$$6. \begin{cases} x + 2y - z = 2 \\ y - 2z = -3 \\ -2x - 2y - z = -8 \end{cases}$$

7. fedcba

8. fcgadbe

$$9. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & -5 & 5 & -7 \\ 2 & 7 & 3 & -1 \end{bmatrix}$$

$$10. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & -5 & 5 & -7 \\ 0 & 3 & 7 & -7 \end{bmatrix}$$

$$11. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & 10 & -15 \end{bmatrix}$$

$$12. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & -5 & 5 & -7 \\ 0 & 8 & -5 & 8 \end{bmatrix}$$

$$13. \begin{bmatrix} 1 & 2 & -2 & 3 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & 7 \end{bmatrix}$$