

## 4.3 Matrices + Systems

Augmented Matrix:

formed by the coefficients of the system.

$$\text{Ex: } \begin{cases} -x + 2y = -4 \\ 5x - 7y = -1 \end{cases}$$
$$\left[ \begin{array}{cc|c} -1 & 2 & -4 \\ 5 & -7 & -1 \end{array} \right]$$

## Elementary Row Operations

1. interchange 2 rows.

2. multiply by a  
non zero number.

3. Add a multiple  
of a row to another  
row.

# Row Echelon Form

2x3: 
$$\left[ \begin{array}{cc|c} 1 & a & b \\ 0 & 1 & c \end{array} \right]$$

3x4: 
$$\left[ \begin{array}{ccc|c} 1 & a & b & d \\ 0 & 1 & c & e \\ 0 & 0 & 1 & f \end{array} \right]$$

$$\begin{cases} x + 2y = 3 \\ 2x - y = -4 \end{cases}$$

$$\left[ \begin{array}{cc|c} 1 & 2 & 3 \\ 2 & -1 & -4 \end{array} \right] -2R_1 + R_2$$

$$\left[ \begin{array}{cc|c} 1 & 2 & 3 \\ 0 & -5 & -10 \end{array} \right] -\frac{1}{5}R_2$$

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

$$x + 2y = 3$$

$$y = 2$$

$$x + 2(2) = 3$$

$$x + 4 = 3$$

$$\begin{array}{r} -4 \quad -4 \\ \hline \end{array}$$

$$x = -1$$

$$\textcircled{(-1, 2)}$$

$$\begin{cases} x - 2y + 2z = 9 \\ x + 3y = 4 \\ 2x - 5y + z = 10 \end{cases}$$

$$\left[ \begin{array}{ccc|c} 1 & -2 & 2 & 9 \\ -1 & 3 & 0 & 4 \\ 2 & -5 & 1 & 10 \end{array} \right] R_1 + R_2$$

$$\left[ \begin{array}{ccc|c} 1 & -2 & 2 & 9 \\ 0 & 1 & 2 & 13 \\ 2 & -5 & 1 & 10 \end{array} \right] -2R_1 + R_3$$

$$\left[ \begin{array}{ccc|c} 1 & -2 & 2 & 9 \\ 0 & 1 & 2 & 13 \\ 0 & -1 & -3 & -8 \end{array} \right] R_2 + R_3$$

$$\left[ \begin{array}{ccc|c} 1 & -2 & 2 & 9 \\ 0 & 1 & 2 & 13 \\ 0 & 0 & -1 & 5 \end{array} \right] -1R_3$$

$$\left[ \begin{array}{ccc|c} 1 & -2 & 2 & 9 \\ 0 & 1 & 2 & 13 \\ 0 & 0 & 1 & -5 \end{array} \right]$$

$$x - 2y + 2z = 9$$

$$y + 2z = 13$$

$$z = -5$$

$$y + 2(-5) = 13$$

$$\begin{array}{r} y - 10 = 13 \\ +10 \quad +10 \\ \hline y = 23 \end{array}$$

$$x - 2(23) + 2(-5) = 9$$

$$x - 46 - 10 = 9$$

$$\begin{array}{r} x - 56 = 9 \\ +56 \quad +56 \\ \hline \end{array}$$

$$x = 65$$

$$(65, 23, -5)$$

p. 270

38-56 e.o.e.  
every even extra  
credit

