

Augmented Matrices

$$\begin{cases} x + 3y = 15 \\ 2x - 3y = -6 \end{cases}$$

$$\begin{bmatrix} 1 & 3 \\ 2 & -3 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ -6 \end{bmatrix}$$

$$\left[\begin{array}{cc|c} 1 & 3 & 15 \\ 2 & -3 & -6 \end{array} \right]$$

Write the following as an augmented matrix

$$5x + 9y = 25$$

$$-7x + 12y = 18$$

$$\left[\begin{array}{cc|c} 5 & 9 & 25 \\ -7 & 12 & 18 \end{array} \right]$$

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

$$-9x + 8y - 7z = 6$$

$$2x + 4y - 6z = 10$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 4 \\ -9 & 8 & -7 & 6 \\ 2 & 4 & -6 & 10 \end{array} \right]$$

Write the following as an augmented matrix and solve.

$$x + 3y = 15$$

$$2x - 3y = -6$$

$$-2 \left(\begin{array}{cc|c} 1 & 3 & 15 \\ 2 & -3 & -6 \end{array} \right)$$

$$r_2 - 2r_1 \rightarrow r_2$$

$$\left(\begin{array}{cc|c} 1 & 3 & 15 \\ 0 & -9 & -36 \end{array} \right)$$

$$\frac{r_2}{-9} \rightarrow r_2$$

$$\left(\begin{array}{cc|c} 1 & 3 & 15 \\ 0 & 1 & 4 \end{array} \right)$$

$$r_1 - 3r_2 \rightarrow r_1$$

$$\left(\begin{array}{cc|c} 1 & 0 & 3 \\ 0 & 1 & 4 \end{array} \right)$$

$$x = 3$$

$$y = 4$$

$$(3, 4)$$

$$\begin{array}{l}
 2x + y = 18 \\
 7x - 3y = 128
 \end{array}$$

$$\left[\begin{array}{cc|c}
 2 & 1 & 18 \\
 7 & -3 & 128
 \end{array} \right]$$

$$\left[\begin{array}{cc|c}
 7 & -3 & 128 \\
 2 & 1 & 18
 \end{array} \right]$$

$$\left[\begin{array}{cc|c}
 13 & 0 & 182 \\
 2 & 1 & 18
 \end{array} \right]$$

$$\left[\begin{array}{cc|c}
 1 & 0 & 14 \\
 0 & 1 & -10
 \end{array} \right]$$

$$\boxed{(14, -10)}$$

$$-4 \begin{pmatrix} 2 & 5 & | & 5 \\ 8 & -9 & | & -67 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 5 & | & 5 \\ 0 & -29 & | & -87 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 5 & | & 5 \\ 0 & -5 & | & -5 \end{pmatrix}$$

$r_1 - 5r_2$

$$\begin{pmatrix} 2 & 0 & | & -10 \\ 0 & -5 & | & -5 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & | & -5 \\ 0 & 1 & | & 3 \end{pmatrix}$$

$(-5, 3)$

$$\begin{bmatrix} 7 & 4 & | & -110 \\ -9 & 5 & | & 40 \end{bmatrix}$$

$r_2 - r_1$

$$\begin{bmatrix} 7 & 4 & | & -110 \\ -16 & 1 & | & 150 \end{bmatrix}$$

$r_1 - 4r_2$

$$\begin{bmatrix} 7 & 0 & | & -710 \\ -16 & 1 & | & 150 \end{bmatrix}$$

$r_1 \cdot \frac{1}{7}$

$$\begin{bmatrix} 1 & 0 & | & -10 \\ -16 & 1 & | & 150 \end{bmatrix}$$

$r_2 + 16r_1$

$$\begin{bmatrix} 1 & 0 & | & -10 \\ 0 & 1 & | & -10 \end{bmatrix}$$

$(-10, -10)$