

Matrices & Determinants

$$\det \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{vmatrix} a & b \\ c & d \end{vmatrix} \rightarrow ad - cb$$

$$\det \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} = \begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} = 4 - 3 = 1$$

$$\det \begin{bmatrix} -3 & -1 \\ -7 & -2 \end{bmatrix} \rightarrow$$

Solving a System of Equations
in two Variables using
Cramer's Rule

- Step 1 → Find The Coefficient Matrix
- 2 → Substitute Constant Terms for 'x' to solve for 'x'.
- 3 → Substitute Constant Terms for 'y' to solve for 'y'.

$$\begin{aligned} 3x + 2y &= 22 \\ 2x + 4y &= -2 \end{aligned}$$

↓ constant

Coeff matrix

$$\det \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} \rightarrow \begin{vmatrix} 3 & -2 \\ 1 & 4 \end{vmatrix} = 14$$

$$x = \frac{\begin{vmatrix} 22 & -2 \\ -2 & 4 \end{vmatrix}}{14} = \frac{84}{14} = 6$$

$$y = \frac{\begin{vmatrix} 3 & 22 \\ 1 & -2 \end{vmatrix}}{14} = -2$$

(6, -2)

$$x - 5y = -5$$

$$-4x - 2y = 20$$

$$C_A = \begin{bmatrix} 1 & -5 \\ -4 & -2 \end{bmatrix}$$

$$x = \frac{\begin{vmatrix} -5 & -5 \\ 20 & -2 \end{vmatrix}}{-22}$$

$$= \frac{\begin{vmatrix} 1 & -5 \\ -4 & -2 \end{vmatrix}}{-22} = \frac{-22}{-22}$$

$$\Rightarrow \textcircled{-5} \quad -2 - (20)$$

$$y = \frac{\begin{vmatrix} 1 & -5 \\ -4 & 20 \end{vmatrix}}{-22} \quad 20 - 20 = \textcircled{0}$$

$$\begin{vmatrix} 4 & 4 \\ 2 & 2 \end{vmatrix} = 0$$