Solving a System of Equations Using Inverse Matrices

Name _____

Date _____ Period _____

Given the following system of equations...

$$ax + by = e$$
$$cx + dy = f$$

We can express this system as a matrix equation

$$\underset{A}{\begin{bmatrix} a & b \\ c & d \end{bmatrix}} \cdot \underset{X}{\begin{bmatrix} x \\ y \end{bmatrix}} = \underset{B}{\begin{bmatrix} e \\ f \end{bmatrix}}$$

Coefficient Matrix • Variable Matrix = Constant Matrix

We want to solve this equation for the variable matrix X

multiply by inverse of A $\quad A \cdot X = B$

use associative property $\quad A^{-1}(A \cdot X) = A^{-1} \cdot B$

creates identity matrix $\quad (A^{-1} \cdot A)X = A^{-1} \cdot B$

definition identity matrix $\quad I \cdot X = A^{-1} \cdot B$

$$X = A^{-1} \cdot B$$

We want to solve this equation for the variable matrix X

Solve the following system using matrices

$$x + y = 8$$
$$2x + y = 1$$

$$X = A^{-1} \cdot B$$

Solve the following system using matrices

$$-3x + 4y = 5$$
$$2x - y = -10$$

$$X = A^{-1} \cdot B$$

Solve the following system using matrices

$$\begin{aligned} x - y + z &= 6 \\ -2y + z &= 7 \\ -2x - 3y &= 4 \end{aligned}$$

$$X = A^{-1} \cdot B$$