

2-2

Solving Systems w/ Matrices

Go over Quiz

Solving a System using Matrices

Matrix A = coefficients (usually a square)

Matrix X = variables

$$\Rightarrow AX = B$$

Matrix B = constants (other side of the =)

So:
$$\begin{cases} 5x + 2y = 3 \\ 4x + 2y = 4 \end{cases} \Rightarrow \begin{bmatrix} 5 & 2 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

 A^{-1} , then $[A]^{-1}[B]$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -2 & \frac{3}{2} \end{bmatrix} \begin{bmatrix} 3 \\ 4 \end{bmatrix} \Rightarrow \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix} \Rightarrow \boxed{(-1, 4)}$$

Remember these?

$$\begin{cases} 2x + z = 2 \\ 5x - y + z = 5 \\ -x + 2y + 2z = 0 \end{cases} \Rightarrow \begin{bmatrix} 2 & 0 & 1 \\ 5 & -1 & 1 \\ -1 & 2 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 & 2 & 1 \\ -11 & 5 & 3 \\ 9 & 4 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ -2 \end{bmatrix} \quad (2, 3, -2)$$

you try

$$\begin{cases} 3x + 2y = 6 \\ 2x - 3y = 17 \end{cases} \Rightarrow \begin{bmatrix} 3 & 2 \\ 2 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 17 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{3}{13} & \frac{2}{13} \\ \frac{2}{13} & -\frac{3}{13} \end{bmatrix} \begin{bmatrix} 6 \\ 17 \end{bmatrix} = \begin{bmatrix} 4 \\ -3 \end{bmatrix} \quad (4, -3)$$

$$\text{or } \begin{bmatrix} 3 & 2 \\ 2 & -3 \end{bmatrix}^{-1} \begin{bmatrix} 6 \\ 17 \end{bmatrix} = \begin{bmatrix} 4 \\ -3 \end{bmatrix}$$

(cont)

Applications

You have \$18 to spend on lunch in a 5-day week. It costs \$1.50 to make lunch at home and \$5 to buy lunch at school. How many times each week do you make lunch at home?

$$\begin{array}{l} x = \text{home} \\ y = \text{school} \end{array} \quad \begin{array}{l} x + y = 5 \\ 1.5x + 5y = 18 \end{array} \quad \begin{bmatrix} 1 & 1 \\ 1.5 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 18 \end{bmatrix} \quad (2, 3)$$

2 times
a week

You try : At a restaurant, one table orders 4 meals and 3 drinks for a total of \$39.25. Another table orders 3 meals and 5 drinks for a total of \$34.25. How much do meals and drinks cost?

$$\begin{array}{l} 4m + 3d = 39.25 \\ 3m + 5d = 34.25 \end{array} \quad \begin{bmatrix} 4 & 3 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} m \\ d \end{bmatrix} = \begin{bmatrix} 39.25 \\ 34.25 \end{bmatrix}$$

Meals cost \$8.50 and drinks cost \$1.75

HW - Whistle