

7.3 Day 2

Solving Using Inverses

Solve: $3x - 2y = 0$
 $-x + y = 5$

augmented matrix

$$\begin{bmatrix} 3 & -2 & 0 \\ -1 & 1 & 5 \end{bmatrix}$$

Matrix eq.

$$A = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix} \cdot X = \begin{bmatrix} x \\ y \end{bmatrix} = B = \begin{bmatrix} 0 \\ 5 \end{bmatrix}$$

$$X = A^{-1}B = \begin{bmatrix} 10 \\ 15 \end{bmatrix} \begin{matrix} = x \\ = y \end{matrix}$$

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Row Echelon Form

1. 1st non zero entry in a row is a 1.
2. Rows of all zeros on bottom.
3. Leading ones go diag. from L to R.

Reduced Row Echelon Form (RRE)

1. Every column w/ a leading one has zeros elsewhere.

Mar 21-10:03 AM

Find RRE form:

$$\begin{bmatrix} 1 & -1 & 2 & -3 \\ 0 & 1 & -1 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix} \text{ row echelon form}$$

$-2R_3 + R_1$
 $R_3 + R_2$

$$\begin{bmatrix} 1 & -1 & 0 & -9 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$R_2 + R_1$

$$\begin{bmatrix} 1 & 0 & 1 & -2 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$x = -2$
 $y = 7$
 $z = 3$

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Find RRE form:

$$\begin{bmatrix} 1 & -2 & 1 & -2 \\ 2 & -3 & 2 & 2 \\ 4 & -8 & 5 & -5 \end{bmatrix}$$

$-2R_1 + R_2$
 $-4R_1 + R_3$

$$\begin{bmatrix} 1 & -2 & 1 & -2 \\ 0 & 1 & 0 & 6 \\ 0 & 0 & 1 & 3 \end{bmatrix} \text{ row echelon form}$$

$-R_3 + R_1$
 $2R_2 + R_1$

$$\begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 1 & 0 & 6 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$x = 7$ $y = 6$ $z = 3$

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Solve the system:

$$\begin{aligned} x + y + z &= 3 \\ 2x + y + 4z &= 8 \\ x + 2y - z &= 1 \end{aligned}$$

$$\begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & 1 & 4 & 8 \\ 1 & 2 & -1 & 1 \end{bmatrix}$$

$$\begin{aligned} & -2R_1 + R_2 \\ & -R_1 + R_3 \end{aligned} \begin{bmatrix} 1 & 1 & 1 & 3 \\ 0 & -1 & 2 & 2 \\ 0 & 1 & -2 & -2 \end{bmatrix} \quad \begin{aligned} & -R_2 \\ & \times \end{aligned} \begin{bmatrix} 1 & 1 & 1 & 3 \\ 0 & 1 & -2 & -2 \\ 0 & 1 & -2 & -2 \end{bmatrix}$$

$$\begin{aligned} & -R_2 + R_3 \end{aligned} \begin{bmatrix} 1 & 1 & 1 & 3 \\ 0 & 1 & -2 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad \begin{aligned} & -R_2 + R_1 \end{aligned} \begin{bmatrix} 1 & 0 & 3 & 5 \\ 0 & 1 & -2 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

row echelon

$$\begin{aligned} x + 3z &= 5 & x &= -3z + 5 \\ y - 2z &= -2 & y &= 2z - 2 \\ z &= z & z &= z \end{aligned}$$

Mar 21-10:27 AM