

Math 12H - Answer Key Section 9.4 - Matrices

P. 673 #2) $\begin{bmatrix} -1 & 5 & 4 & 0 \\ 0 & 2 & 11 & 3 \end{bmatrix}$ Dimensions = 2×4
 $R \times C$

#4) $\begin{bmatrix} -3 \\ 0 \\ 1 \end{bmatrix}$ Dimensions = 3×1

#6) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ Dimensions = 2×2

#16) Solve using Gauss-Jordan Elimination = Reduced row-echelon form.

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

$$\begin{bmatrix} 1 & 1 & 6 & 3 \\ 1 & 1 & 3 & 3 \\ 1 & 2 & 4 & 7 \end{bmatrix}$$

$$\begin{aligned} & -R_1+R_2 = \\ & -R_1+R_3 = \end{aligned} \begin{bmatrix} 1 & 1 & 6 & 3 \\ 0 & 0 & -3 & 0 \\ 0 & 1 & -2 & 4 \end{bmatrix}$$

$$R_2 \div -3$$

$$\begin{bmatrix} 1 & 1 & 6 & 3 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & -2 & 4 \end{bmatrix}$$

swap R_2
with R_3

$$\begin{bmatrix} 1 & 1 & 6 & 3 \\ 0 & 1 & -2 & 4 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$\begin{aligned} & -6R_3+R_1 = \\ & +2R_3+R_2 = \end{aligned} \begin{bmatrix} 1 & 1 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$R_1 - R_2 =$

$$\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$\begin{aligned} x &= -1 \\ y &= 4 \\ z &= 0 \end{aligned}$$

$(-1, 4, 0)$

#18) $x + y + z = 4$

$$\begin{aligned} -x + 2y + 3z &= 17 \\ 2x - y &= -7 \end{aligned}$$

$$\begin{bmatrix} 1 & 1 & 1 & 4 \\ -1 & 2 & 3 & 17 \\ 2 & -1 & 0 & -7 \end{bmatrix} \begin{array}{l} R_1, R_2 \\ -2R_1 + R_3 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & 3 & 4 & 21 \\ 0 & -3 & -2 & -15 \end{bmatrix} \begin{array}{l} R_2 + R_3 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & 3 & 4 & 21 \\ 0 & 0 & 2 & 6 \end{bmatrix} \begin{array}{l} R_3 \div 2 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & 3 & 4 & 21 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} -R_3 + R_1 \\ -4R_3 + R_2 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 3 & 0 & 9 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} R_2 \div 3 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} R_1 - R_2 \end{array}$$

$$\begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} X = -2 \\ Y = 3 \\ Z = 3 \end{array} \quad (-2, 3, 3)$$

#20) $2y + z = 4$

$$\begin{aligned} x + y &= 4 \\ 3x + 3y - z &= 10 \end{aligned}$$

$$\begin{bmatrix} 0 & 2 & 1 & 4 \\ 1 & 1 & 0 & 4 \\ 3 & 3 & -1 & 10 \end{bmatrix} \begin{array}{l} -3R_2 + R_3 \end{array}$$

$$\begin{bmatrix} 0 & 2 & 1 & 4 \\ 1 & 1 & 0 & 4 \\ 0 & 0 & -1 & -2 \end{bmatrix} \begin{array}{l} \text{Swap} \\ R_1, R_2 \\ R_2 \end{array}$$

$$\begin{bmatrix} 0 & 2 & 1 & 4 \\ 1 & 1 & 0 & 4 \\ 0 & 0 & -1 & -2 \end{bmatrix} \begin{array}{l} R_3 \div -1 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 0 & 4 \\ 0 & 2 & 1 & 4 \\ 0 & 0 & 1 & 2 \end{bmatrix} \begin{array}{l} R_2 - R_3 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 0 & 4 \\ 0 & 2 & 0 & 2 \\ 0 & 0 & 1 & 2 \end{bmatrix} \begin{array}{l} R_2 \div 2 \end{array}$$

$$\begin{bmatrix} 1 & 1 & 0 & 4 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \begin{array}{l} R_1 - R_2 \end{array}$$

$$\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \begin{array}{l} X = 3 \\ Y = 1 \\ Z = 2 \end{array} \quad (3, 1, 2)$$