

Name Key

Use each matrix to solve for the missing variables.

$$1) \begin{bmatrix} 12 & -8 & z \\ 3y-5 & 15 & -1 \\ 0 & 0.5x & 8 \end{bmatrix} = \begin{bmatrix} 12 & -8 & (x+y) \\ 22 & 15 & -1 \\ 0 & -9 & 8 \end{bmatrix}$$

$$0.5x = -9 \\ x = -18$$

$$3y - 5 = 22 \\ 3y = 27 \\ y = 9$$

$$z = x + y \\ z = -18 + 9 \\ z = -9$$

$$(-18, 9, -9)$$

$$2) \begin{bmatrix} 2x-5y \\ x+3y \end{bmatrix} = \begin{bmatrix} 25 \\ 7 \end{bmatrix}$$

$$2x + 5y = 25 \\ x + 3y = 7$$

$$2(7-3y) - 5y = 25 \\ 14 - 6y - 5y = 25 \\ 14 - 11y = 25 \\ -11y = 11 \\ y = -1$$

$$x = 7 - 3(-1) \\ x = 10$$

$$(10, -1)$$

Use the matrices shown below to find the following operations.

$$A = \begin{bmatrix} 6 & -1 \\ 0 & 5 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix} \quad C = \begin{bmatrix} 4 & -2 & -1 \\ 8 & 0 & -6 \\ -1 & -3 & 7 \end{bmatrix} \quad D = \begin{bmatrix} 2 & 0 \\ 2 & -5 \\ 2 & -8 \end{bmatrix}$$

3) $A + B$

$$= \begin{bmatrix} 6+(-1) & -1+2 \\ 0+(-3) & 5+4 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 1 \\ -3 & 9 \end{bmatrix}$$

4) $B - A$

$$= \begin{bmatrix} -1-6 & 2-(-1) \\ -3-0 & 4-5 \end{bmatrix}$$

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

5) $-5D$

$$= \begin{bmatrix} -5(2) & -5(0) \\ -5(2) & -5(-5) \\ -5(2) & (-5)(-8) \end{bmatrix}$$

$$= \begin{bmatrix} -10 & 0 \\ -10 & 25 \\ -10 & 40 \end{bmatrix}$$

6) AB

$$= \begin{bmatrix} 6(-1) + (-1)(-3) & 6(2) + (-1)(4) \\ 0(-1) + 5(-3) & 0(2) + 5(4) \end{bmatrix}$$

$$= \begin{bmatrix} -3 & 8 \\ -15 & 20 \end{bmatrix}$$

7) CD

$$= \begin{bmatrix} 4(2) + (-2)(2) + (-1)(2) & 4(0) + (-2)(-5) + (-1)(8) \\ 8(2) + 0(2) + (-6)(2) & 8(0) + (0)(-5) + (-6)(8) \\ -1(2) + (-3)(2) + 7(2) & -1(0) + (-3)(5) + 7(-8) \end{bmatrix}$$

$$= \begin{bmatrix} 2 & 2 \\ 4 & 48 \\ 6 & -41 \end{bmatrix}$$

Using the same matrices from above, determine the determinants for the following.

$$\begin{aligned}
 8) \quad |A| &= 6(5) - (-1)(0) \\
 &= 30 - 0 \\
 &= 30
 \end{aligned}$$

$$\begin{aligned}
 9) \quad |B| &= -1(4) - 2(-3) \\
 &= -4 + 6 \\
 &= 2
 \end{aligned}$$

$$\begin{aligned}
 10) \quad |C| &= \begin{vmatrix} 4 & -2 & -1 \\ 8 & 0 & -6 \\ -1 & -3 & 7 \end{vmatrix} \begin{vmatrix} 4 & -2 \\ 8 & 0 \\ -1 & -3 \end{vmatrix} \\
 R &= 4(0)(7) + (-2)(-6)(-1) + (-1)(8)(-3) \\
 &= 0 + (-12) + 24 = 24 \text{ (right diag.)} \\
 L &= -1(0)(-1) + 4(-6)(-3) + (-2)(8)(7) \\
 &= 0 + 72 + (-112) = -40 \text{ (left diag.)} \\
 \text{Det.} &= 24 - (-40) = 64
 \end{aligned}$$

Use Cramer's Rule to find the solutions to the system of equations.

$$\begin{aligned}
 11) \quad 4x - 3y &= 6 \\
 2x + 5y &= -10
 \end{aligned}$$

$$x = \frac{\begin{vmatrix} 6 & -3 \\ -10 & 5 \end{vmatrix}}{\begin{vmatrix} 4 & -3 \\ 2 & 5 \end{vmatrix}} \quad y = \frac{\begin{vmatrix} 4 & 6 \\ 2 & -10 \end{vmatrix}}{\begin{vmatrix} 4 & -3 \\ 2 & 5 \end{vmatrix}}$$

$$x = \frac{30 - 30}{20 - (-6)} \quad y = \frac{-40 - 12}{20 - (-6)}$$

$$x = 0 \quad y = -2 \\
 (0, -2)$$

$$\begin{aligned}
 12) \quad x - 8y &= 1 \\
 5y + 5x &= 95
 \end{aligned}$$

$$x = \frac{\begin{vmatrix} 1 & -8 \\ 95 & 5 \end{vmatrix}}{\begin{vmatrix} 1 & -8 \\ 5 & 5 \end{vmatrix}} \quad y = \frac{\begin{vmatrix} 1 & 1 \\ 5 & 95 \end{vmatrix}}{\begin{vmatrix} 1 & -8 \\ 5 & 5 \end{vmatrix}}$$

$$x = \frac{5 - (-760)}{5 - (-40)} \quad y = \frac{95 - 5}{5 - (-40)}$$

$$x = \frac{765}{45} = 17 \quad y = 2$$

$$(17, 2)$$

$$\begin{aligned}
 13) \quad x + 3y - z &= 5 \\
 2x + 5y - z &= 12 \\
 x - 2y - 3z &= -13
 \end{aligned}$$

$$x = \frac{\begin{vmatrix} 5 & 3 & -1 \\ 12 & 5 & -1 \\ -13 & -2 & -3 \end{vmatrix}}{\begin{vmatrix} 1 & 3 & -1 \\ 2 & 5 & -1 \\ 1 & -2 & -3 \end{vmatrix}}$$

$$x = \frac{21}{7}$$

$$y = \frac{\begin{vmatrix} 1 & 5 & -1 \\ 2 & 12 & -1 \\ 1 & -13 & -3 \end{vmatrix}}{\begin{vmatrix} 1 & 3 & -1 \\ 2 & 5 & -1 \\ 1 & -2 & -3 \end{vmatrix}}$$

$$y = \frac{14}{7}$$

$$z = \frac{\begin{vmatrix} 1 & 3 & 5 \\ 2 & 5 & 12 \\ 1 & -2 & -13 \end{vmatrix}}{\begin{vmatrix} 1 & 3 & -1 \\ 2 & 5 & -1 \\ 1 & -2 & -3 \end{vmatrix}}$$

$$z = \frac{28}{7}$$

$$(3, 2, 4)$$