

7.2

Perform the indicated operation (NO Calculator):

1.  $\begin{bmatrix} -1 & 3 \\ 7 & 0 \\ 2 & -3 \end{bmatrix} \cdot \begin{bmatrix} -2 & 4 & 1 \\ 5 & -1 & 3 \end{bmatrix}$  multiply  
 $3 \times 2 \cdot 2 \times 3 = 3 \times 3$

$$\begin{bmatrix} 17 & -7 & 8 \\ -14 & 28 & 7 \\ -19 & 11 & -7 \end{bmatrix}$$

2.  $\begin{bmatrix} 3 & -7 \\ -4 & 0 \end{bmatrix} - \begin{bmatrix} -2 & 2 \\ 3 & -8 \end{bmatrix}$  subtract

$$\begin{bmatrix} 5 & -9 \\ -7 & 8 \end{bmatrix}$$

Examine the product of the two matrices to determine if each is the inverse of the other (NO Calculator):

3.  $\begin{matrix} A & B \\ \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix} & \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix} \end{matrix}$   $\begin{matrix} A \\ \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix} \end{matrix}$   
 $AB = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$   $BA = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$   
 Identity Identity

**Inverses**

4.  $\begin{matrix} A & B \\ \begin{bmatrix} 1 & 0 & 1 \\ -3 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix} & \begin{bmatrix} 1 & 0 & -1 \\ 3 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix} \end{matrix}$   
 $AB = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$   $BA = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

**Inverses**

Given A, find  $A^{-1}$ , if it exists. (NO Calc for 5, 6; Calc OK for 7,8)

5.  $\begin{bmatrix} -5 & 4 \\ 4 & -3 \end{bmatrix}$   
 $\det A = ad - bc = -1$  exists

$$A^{-1} = \frac{1}{-1} \begin{bmatrix} -3 & -4 \\ -4 & -5 \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ 4 & 5 \end{bmatrix}$$

6.  $\begin{bmatrix} 3 & 9 \\ 2 & 6 \end{bmatrix}$   
 $\det A = 0$   
 $A^{-1}$  doesn't exist

7.  $\begin{bmatrix} 1 & -1 & 0 \\ 2 & -1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$   
 $A^{-1}$  = doesn't exist

8.  $\begin{bmatrix} 1 & 2 & -1 \\ 2 & -1 & 3 \\ -1 & 0 & 1 \end{bmatrix}$   
 $A^{-1} = \begin{bmatrix} \frac{1}{10} & \frac{1}{5} & -\frac{1}{2} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{1}{10} & \frac{1}{5} & \frac{1}{2} \end{bmatrix}$

## 7.3

Solve using matrices (NO Calculator).

$$9. \quad \begin{aligned} 3x - y &= 2 \\ x + 2y &= 10 \end{aligned}$$

$$A = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix} \quad X = \begin{bmatrix} x \\ y \end{bmatrix} \quad B = \begin{bmatrix} 2 \\ 10 \end{bmatrix}$$

$$A \cdot X = B$$

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

$$A^{-1} = \frac{1}{7} \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} \frac{2}{7} & \frac{1}{7} \\ -\frac{1}{7} & \frac{3}{7} \end{bmatrix}$$

$$X = \begin{bmatrix} \frac{2}{7} & \frac{1}{7} \\ -\frac{1}{7} & \frac{3}{7} \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 10 \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \end{bmatrix} \quad \boxed{\begin{matrix} x=2 \\ y=4 \end{matrix}}$$

Solve the systems using matrices (Calc OK).

$$x - 3y = 2$$

$$10. \quad \begin{aligned} 2y + z &= -1 \\ x - y + z &= 1 \end{aligned}$$

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

$$X = A^{-1}B = \text{no solution}$$

$$a - b + 3c - 2d = 1$$

$$11. \quad -2a + 4b - 3c + d = 0.5$$

$$3a - b + 10c - 4d = 2.9$$

$$4a - 3b + 8c - 2d = 0.6$$

augmented matrix:

$$A = \begin{bmatrix} 1 & -1 & 3 & -2 & 1 \\ -2 & 4 & -3 & 1 & .5 \\ 3 & -1 & 10 & -4 & 2.9 \\ 4 & -3 & 8 & -2 & .6 \end{bmatrix}$$

$$\text{rref}([A]) = \begin{bmatrix} 1 & 0 & 0 & 0 & -\frac{1}{2} \\ 0 & 1 & 0 & 0 & \frac{1}{5} \\ 0 & 0 & 1 & 0 & \frac{3}{10} \\ 0 & 0 & 0 & 1 & -\frac{2}{5} \end{bmatrix}$$

$$\boxed{a = -\frac{1}{2} \quad b = \frac{1}{5} \quad c = \frac{3}{10} \quad d = -\frac{2}{5}}$$