MAC 1140 | # *Matrix Operations* | *Instr: Jamieson*

Chapter 6 Sections 4 – 5 | *Last updated 4/24/2012*

$\mathbf{A_{mn}}$ is the entry in **row m** and **column n** of the matrix A.

1. Solve $\begin{cases} x + y + z = 6 \\ x - y + z = 2 \\ x + 2y - z = 2 \end{cases}$

2. Solve $\begin{cases} x + y + z = 6 \\ x - y + z = 2 \\ x + 2y - z = 2 \end{cases}$

3. Solve $\begin{cases} x + y + 0.1z = 0.1 \\ x - y + z = 5 \\ x + 2y - z = -3 \end{cases}$

4. Solve $\begin{cases} x + y + z = -0.8 \\ x - y + z = 3.2 \\ x + 2y - z = -4.8 \end{cases}$

5. If $\mathbf{A} = \begin{bmatrix} 1 & 0 & 3 & -2 & 4 \\ 2 & -5 & 2 & 9 & 8 \\ -7 & 8 & -6 & 5 & 2 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 3 & -4 & 7 & 2 & -1 \\ 2 & -5 & 4 & 3 & -5 \\ 2 & -1 & -3 & -2 & 4 \end{bmatrix}$,

find the entry in row 3 column 4 of 2**A** – 3**B**.

For more practice: you can also find any other single entry in 2**A** – 3**B.**

6. Find the entry in row 3 column 2 of 4**A** – 5**B**, if

$\mathbf{A} = \begin{bmatrix} 1 & 2 & -3 \\ 3 & -2 & 1 \\ 3 & 4 & -5 \\ 1 & 3 & -2 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 3 & 1 & 2 \\ -2 & 4 & -5 \\ 2 & -3 & 7 \\ 0 & -2 & 6 \end{bmatrix}$

For more practice: you can also find any other single entry in 4**A** – 5**B.**

Matrix Operations

7. If $\mathbf{A}=\begin{bmatrix} 1 & 0 & 3 & -2 & 4 \\ 2 & -5 & 2 & 9 & 8 \\ -7 & 8 & -6 & 5 & 2 \end{bmatrix}$ and $\mathbf{B}=\begin{bmatrix} 3 & -4 & 7 \\ -1 & 2 & 4 \\ 2 & -1 & -3 \\ -3 & -2 & 1 \\ 4 & 3 & -2 \end{bmatrix}$,

find the entry in row 2 column 3 of **AB**.

For more practice: you can also find any other single entry in **AB.**

8. Find the entry in row 3 column 2 of **AB**, if

$$A=\begin{bmatrix} 2 & -2 & 3 \\ 1 & -3 & 2 \\ 4 & -2 & 1 \\ -1 & 3 & 2 \end{bmatrix} \quad \text{and} \quad B=\begin{bmatrix} 1 & -2 & -3 & 4 & -1 \\ 0 & 1 & 3 & -2 & -4 \\ 2 & -2 & 3 & -1 & -3 \end{bmatrix}$$

For more practice: you can also find any other single entry in **AB.**

9. Give two 2 x 2 matrices **A** and **B** such that **AB** ≠ **BA**. Show that they are not equal.

10. Give the 2 x 3 matrix **X** such that for every 2 x 3 matrix **A**, **X** + **A** = **A** + **X** = **A**.

11. Give the 5 x 5 matrix **X** such that for every 5 x 5 matrix **A**, **XA** = **AX** = **A**.

12. Find the inverse of $\mathbf{A}=\begin{bmatrix} 1 & 0 & -2 \\ 0 & -1 & 0 \\ -0.2 & 0.4 & 0.5 \end{bmatrix}$

13. Find the inverse of $\mathbf{A}=\begin{bmatrix} 1 & -2 & -2 \\ 1 & 0 & 0 \\ -0.2 & 1 & 0.5 \end{bmatrix}$

Answers:

1. x = 1; y = 2; z = 3

2. x = 0.1; y = 5; z = -3

3. x = 2; y = -2; z = 1

4. x = 0.2; y = -2; z = 1

5. 2·5 – 3(-2) = 16

Matrix Operations

For more practice: Other entries are given by $2\mathbf{A}-3\mathbf{B}=\begin{bmatrix}-7 & 12 & -15 & -10 & 11\\ -2 & 5 & -8 & 9 & 31\\ -20 & 19 & -3 & 16 & -8\end{bmatrix}$

6. 31

$4\mathbf{A} - 5\mathbf{B} = \begin{bmatrix}-11 & 3 & -22\\ 22 & -28 & 29\\ 2 & 31 & -55\\ 4 & 22 & -38\end{bmatrix}$

7. In the instructions "row 2 column 3" means you will combine row 2 from the left factor of **AB** with column 3 from the right factor of **AB** as follows.

Row 2: 2( ) + -5( ) + 2( ) + 9( ) + 8( )

Fill in with column 3: 2(7) + -5(4) + 2(-3) + 9(1) + 8(-2) = -19

So the answer is -19

For more practice: $\mathbf{AB}=\begin{bmatrix}31 & 9 & -12\\ 20 & -14 & -19\\ -48 & 46 & 2\end{bmatrix}$

8. Row 3: 4( ) + (-2)( ) + 1( )

Fill in with column 2: 4(-2) + (-2)(1) + 1(-2) = -12

AB = $\begin{bmatrix}8 & -12 & -3 & 9 & -3\\ 5 & -9 & -6 & 8 & 5\\ 6 & -12 & -15 & 19 & 1\\ 3 & 1 & 18 & -12 & -17\end{bmatrix}$

9. A = $\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$; **B** = $\begin{bmatrix}5 & 6\\ 7 & 8\end{bmatrix}$ **AB** = $\begin{bmatrix}19 & \_\\ \_ & \_\end{bmatrix}$ **BA** = $\begin{bmatrix}23 & \_\\ \_ & \_\end{bmatrix}$

10. $\mathbf{X}=\begin{bmatrix}0 & 0 & 0\\ 0 & 0 & 0\end{bmatrix}$ This is generally denoted $\mathbf{0}_{23}$

11. $\mathbf{I} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$ This is generally denoted $\mathbf{I}_{55}$ or just $\mathbf{I}_5$, since every multiplicative identity matrix must be square.

12. $\mathbf{A}^{-1} = \begin{bmatrix} 5 & 8 & 20 \\ 0 & -1 & 0 \\ 2 & 4 & 10 \end{bmatrix}$

Create **A** in the calculator. Enter $[A]^{-1}$ using the key [x^{-1}]. The calculator will recognize that [A] is a matrix instead of a number.

13. $\mathbf{A}^{-1} = \begin{bmatrix} 0 & 1 & 0 \\ 0.5 & -0.1 & 2 \\ -1 & 0.6 & -2 \end{bmatrix}$