Math 111 – Matrices on the TI-82/TI-83/TI-84

1. Entering Matrices

To enter the two matrices \( A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix} \) and \( B = \begin{bmatrix} 2 & -1 \\ -1 & -8 \end{bmatrix} \)

Press [MATRX] enter to enter \([A]\).

Enter the dimensions of \( A \): 2 enter 2 enter

Enter the first row: 1 enter -1 enter, (1, 1 = 1, 1, 2 = -1)

Enter the second row: 2 enter -1 enter, (2, 1 = 2, 2, 2 = -1)

After entering the matrix completely exit: 2nd MODE

Press [MATRX] enter 2 to enter the second matrix, \([B]\).

Note: You can edit any entry by using the arrow keys.

2. To display a matrix on the screen

Press [MATRX] enter enter to see \([A]\), [MATRX] enter 2 enter for \([B]\)

Notice that each row of a matrix is enclosed in brackets, as is the whole matrix.

3. Solving a System of Equations (TI-83 ONLY)

You can obtain the reduced row echelon form of an augmented matrix by pressing:

\[
\text{MATRX} > \n \checkmark \text{ (until rref)} \text{ ENTER} \text{ matrix name}
\]

This gives a simple way of solving a system of linear equations.

If you have a row in the form \([0 \ 0 \ \ldots \ 0 \ : \ c] \ (c \neq 0)\) at the bottom of the matrix, there is NO SOLUTION.

If you have a row of the form \([0 \ 0 \ \ldots \ 0 \ : \ 0]\) at the bottom, the system is DEPENDENT and has infinite solutions.

You can use this to check your answers, but you still need to be able to do this by hand.
Examples:

1. One Solution: \[ x + y + z = 6 \]

   Matrix form:
   \[
   \begin{bmatrix}
   1 & 1 & 1 & 6 \\
   0 & 1 & 3 & 11
   \end{bmatrix}
   \]

   rref:
   \[
   \begin{bmatrix}
   1 & 0 & 0 & 1 \\
   0 & 1 & 0 & 2
   \end{bmatrix}
   \]

   Solution: \((1, 2, 3)\).

2. No Solutions: \[ 2x - 2y + 6z = 7 \]

   Matrix:
   \[
   \begin{bmatrix}
   2 & -2 & 6 & 7 \\
   3 & -1 & 5 & 14
   \end{bmatrix}
   \]

   rref:
   \[
   \begin{bmatrix}
   1 & -2 & 2 & 4 \\
   0 & 0 & 1 & 0
   \end{bmatrix}
   \]

3. Infinite Solutions: \[ 5x - 10y + z = 20 \]

   Matrix:
   \[
   \begin{bmatrix}
   5 & -10 & 5 & 20 \\
   -2 & 4 & -2 & -8
   \end{bmatrix}
   \]

   rref:
   \[
   \begin{bmatrix}
   1 & 0 & 0 & 1 \\
   0 & 0 & 1 & 0
   \end{bmatrix}
   \]

4. Matrix Math Functions

   1. Addition, \([A] + [B]\):
      \[
      \text{MATRX} \ 1 \ + \ \text{MATRX} \ 2 \ \text{ENTER}
      \]

   2. Subtraction, \([A] - [B]\):
      \[
      \text{MATRX} \ 1 \ - \ \text{MATRX} \ 2 \ \text{ENTER}
      \]

   3. Scalar Multiplication, \(3[A]\):
      \[
      \text{MATRX} \ 1 \ \	ext{ENTER}
      \]

   4. Multiplication, \([A][B] \text{ or } [A]*[B]\):
      \[
      \text{MATRX} \ 1 \ x \ \text{MATRX} \ 2 \ \text{ENTER}
      \]

   5. Inverse \(A^{-1}\):  \[
      \text{MATRX} \ 2\text{nd} \ X^{-1}
      \]

Answers:

1. \[
   \begin{bmatrix}
   3 & -2 \\
   1 & -9
   \end{bmatrix}
   \]

2. \[
   \begin{bmatrix}
   -1 & 0 \\
   3 & 7
   \end{bmatrix}
   \]

3. \[
   \begin{bmatrix}
   3 & -3 \\
   6 & -3
   \end{bmatrix}
   \]

4. \[
   \begin{bmatrix}
   3 & 7 \\
   5 & 6
   \end{bmatrix}
   \]

5. \[
   \begin{bmatrix}
   -1 & 1 \\
   -2 & 1
   \end{bmatrix}
   \]

If an operation is not possible, you will get an error message.