

## Properties of Matrices




Name \_\_\_\_\_

Class \_\_\_\_\_




*In this activity, you will explore:*


- *Properties of Matrices*
- *Procedures to solve systems of equations using matrices*




Follow this document to discover and study the properties of matrices.


Open a new document in calculator mode   .


Enter a 3 x 3 matrix of your choice on to calculator page

  3 x 3 matrix. You must  from cell to cell.

Press . Copy your matrix on this sheet.

Find the determinant of the matrix to make sure it is not zero.  $\det(\blacktriangle\blacktriangle)$  until your matrix is highlighted, then  ). Press  to check your determinant. If determinant is zero, press  $\blacktriangle\blacktriangle$  until your matrix is highlighted, then  and change one number to make your determinant nonzero. Write down the determinant of your matrix.

We want to see what happens if you change rows in a matrix. Press  $\blacktriangle\blacktriangle$  until  $\det(\text{matrix})$  is highlighted, then  to paste your matrix on the command line. Now switch any two rows in your matrix. Remember your original matrix is right there for you to see. What happened to the determinant?

Now we want to see what happens if you change columns in a matrix. Press  $\blacktriangle\blacktriangle$  until  $\det(\text{matrix})$  is highlighted, then  to paste your matrix on the command line. Now switch any two columns in the matrix you just made. Remember that matrix is right there for you to see. What happened to the determinant?

Now let's see what multiplying a row in a matrix will do to the determinant. Press  $\blacktriangle\blacktriangle$  until  $\text{det}(\text{matrix})$  is highlighted, then  $\left[ \begin{array}{c} \text{2} \\ \text{enter} \end{array} \right]$  to paste your matrix on the command line. Multiply the **first** row by 2. Find the determinant. How does this determinant compare with the previous one?

Press  $\blacktriangle\blacktriangle$  until  $\text{det}(\text{matrix})$  is highlighted, then  $\left[ \begin{array}{c} \text{2} \\ \text{enter} \end{array} \right]$  to paste your matrix on the command line. Multiply the **second** row by 2. Find the determinant. How does this determinant compare with the previous one?

Press  $\blacktriangle\blacktriangle$  until  $\text{det}(\text{matrix})$  is highlighted, then  $\left[ \begin{array}{c} \text{2} \\ \text{enter} \end{array} \right]$  to paste your matrix on the command line. Multiply the **third** row by 2. Find the determinant. How does this determinant compare with the previous one?

After we have multiplied all three rows by 2, we have effectively multiplied the matrix by the scalar 2. (2 [...])

How does multiplying a 3 x 3 matrix by the scalar 2 affect the determinant of the matrix?

How will changing the scalar affect the determinant?

How will changing the size of the matrix change the determinant when the matrix is multiplied by a scalar?

Give an example of each.

$$A = \begin{bmatrix} 2 & 1 \\ -3 & 5 \end{bmatrix}, B = \begin{bmatrix} -1 & 2 \\ 4 & 3 \end{bmatrix}. \text{ Find } |A|, |B|, |A \cdot B|.$$

If you have  $|A| = a$  and  $|B| = b$ , make a conjecture about  $|A \cdot B|$ .

Write a summary of what you have learned about the properties of matrices.