Algebra 2
Unit: Systems of Equations and Inequalities
Section: Matrices and Determinants

Tutorial: Multiplication of Matrices

Slide 1
In this tutorial we will discuss how to multiply to matrices. Make sure that you can multiply the matrices before beginning any computation.

Slide 2
Use the following general rule for multiplying matrices.
Find the entry in row *i* and column *j* of AB by finding the sum of the products of the corresponding entries in row *i* of A and column *j* of B.
A times B will have entries that will be made up of row one of A and column one of B, row one of A and column two of B, row two of A and column one of B, and row two of A and column two of B.
Let's see how this rule works in an example.

Slide 3
Example
Let matrix A has first row one, five, and second row four, seven and matrix B has first row seven, eight, and second row zero, two.
Again, use the rule of matrix multiplication to find the product.
To find the entry in the first row, first column multiply one times seven and add five times zero. This will yield seven. These numbers come from the first row of A, first column of B.
To find the entry in the first row second column multiply one times eight and add five times 2. This will yield eighteen. These numbers come from the first row of A, second column of B.
To find the entry in the second row first column, multiply four times seven and add seven times zero. This will yield twenty eight. These numbers come from the second row of A, first column of B.
To find the entry in the second row second column, multiply four times eight and add seven times two. This will yield 46. These numbers come from the second row of A second column of B.

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Let's look at one more example.
Multiply the matrix with one row three, three, one by matrix with first row zero, three, second row two, one, and third row three, six.
Since the first matrix has dimensions one by three and the second matrix has dimensions three by two our final product matrix will have dimensions one by two.
Using the same procedure as the previous example the first entry is three times zero plus three times two plus one times three which yields nine. These numbers come from the first row of the first matrix and the first column of the second matrix.
The second entry is three times three plus three times one plus one times six which yields eighteen. These numbers come from the first row of the first matrix and the second column of the second matrix.

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Now you try.
Work through the following problems. Click on Solution to check your work. If the product matrix does not exist, write "does not exist" as your answer.

1. First matrix has row one 5, 8, negative 9, row two 7, 2, 0. Second matrix has row one 3, 8, negative 5, row two 5, 0, 1.

Answer: Does not exist.

2. First matrix has row one 0, 2, row two 1, 1, row three negative 3, 1 and row four negative 2, 4. Second matrix has row one 2, and row two 1.

Answer: Row one is 2, row two is 3, row three is negative 5, and row four is 0.

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Remember that when dealing with matrix multiplication, use the general rule for multiplication and adapt it to any size matrices.

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Now we can write the final equation.
F of x is equal to negative five times the quantity x squared minus fourteen x plus forty eight.
F of x is equal to negative five x squared plus seventy x plus two hundred forty.

Screen 8

Suppose a quadratic function has roots at negative 3 and 5 and a vertex at (1, negative 16). Write this quadratic function using the general formula.
Check your answer by clicking the solution button.

Solution:
Sum of the roots:
$r_1 + r_2$ = negative 3 + 5 = 2
Product of the roots:
r_1 times r_2 = negative 3 times 5 = negative 15

f of x equals a times the quantity x squared minus 2x minus 15.

Use the vertex (1, negative 16) to find a.
negative 16 = a times the quantity 1 squared minus 2 times 1 minus 15
negative 16 = a times negative 16
1 = a

f of x equals x squared minus 2x minus 15

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Here are the steps we used to write a quadratic function using the roots and the vertex.
Find the sum and the product of the roots.
We can now insert these two quantities into our general equation.
Solve for a.
Write the final equation.