Math 323
Linear Algebra and Matrix Theory I
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Lesson 4
Matrix Operations

4.1 Matrix Operations

- Example 4.1.1
  If A = [2 3 -5; 1 2 7] and B = [2 -1 10; 11 9 4], then find 5A and A + 3B.

Matrices can be multiplied by a scalar and added together much like vectors, provides the matrices have the same size, that is the same number of rows and the same number of columns.

```
A = [2 3 -5; 1 2 7], B = [2 -1 10; 11 9 4], ans_1=5*A, ans_2=A+3*B

A =
     2     3    -5
     1     2     7
B =
     2    -1    10
    11     9     4
ans_1 =
    10    15   -25
     5    10    35
ans_2 =
     8     0    25
    34    29    19
```

- Example 4.1.2
  If A = [2 3 -5; 1 2 7] and B = [2 -1 10 7; 11 9 4 2; -3 2 1 8], then find AB.

Two matrices A and B can be multiplied to form AB if the number of columns of A equals the number of rows of B. Our matrix A has three columns while the matrix B has three rows, the product AB therefore exists. On the other hand the product BA does not exist, do you know why?

```
A = [2 3 -5; 1 2 7], B = [2 -1 10 7; 11 9 4 2; -3 2 1 8], AB=A*B

A =
     2     3    -5
     1     2     7
```

```
B =
     2    -1    10     7
    11     9     4     2
    -3     2     1     8
AB =
    52    15    27   -20
     3    31    25    67
```

- Example 4.1.3

If A = [2 3 -5; 1 2 7; -2 7 -6] and B = [2 -1 10 7; 11 9 4 2; -3 2 1 8], then create the block matrix [A B].

Block matrices can be entered in **MATLAB** in a manner similar to that of ordinary matrices. The blocks are merely interpreted as elements of the new matrix, in this example as the elements of a matrix with one row and two columns.

```
A = [2 3 -5; 1 2 7; -2 7 -6], B=[2 -1 10 7; 11 9 4 2; -3 2 1 8],
blockmatrix=[A B]
```

```
A =
     2     3    -5
     1     2     7
    -2     7    -6
B =
     2    -1    10     7
    11     9     4     2
    -3     2     1     8
blockmatrix =
     2     3    -5     2    -1    10     7
     1     2     7    11     9     4     2
    -2     7    -6    -3     2     1     8
```