Hi students.

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at addition and subtraction, arrays multiplication, array

division, an element by element operations. This is module #8

under Unit 3 that is,mathematical operations with

arrays. This is the outline of the presentation the learning

outcomes. So, by the end of the presentation, the student will

be able to perform most basic and common mathematical

operations using arrays in Matlab. So coming to addition

and subtraction, so we have the plus and the minus operators for

performing the addition and subtraction in Matlab. So here

we can add and subtract arrays of identical sizes. That is, for

a matrix it should be same number of rows.

And columns, so here if we take examples of two matrices A&B

your A&B, both are of identical size that is A is 2 cross 3

and B is 2 cross 3. So when we add this matrix, that is obtained

by A + B. So here we add individual elements so A11

plus, B11 plus A11, A12 plus B12 and A13 plus B13 will give us the

first row and the 2nd row is obtained by A21 + B21, A22

plus B22 and A23 plus B23. This is the result of A+B.

Let's look at examples of addition and subtraction of

vectors. If VectA is this vector and Vect B is a vector, then

VectC is equal to VectA+VectB. Here we are adding two different row

vectors, so 8 plus 10 is 18, 5 + 5 = 10 and 4 + 3

is 7. The next is VecB minusVectA. So here we are

subtracting vector A from B, so

it is 10 -- 8 that is 2, 5 -- 5 which is 0 and 3 -- 4

that is minus one. The next is addition and subtraction of matrices.

 If a A and B are two matrices then A minus B is going to subtract

the two matrices, so here it will be 5 -- 10 = -5, - 3 -7

minus ten. 8 -- 4 is 4 and the next row will be 9 minus of

minus -11=20. 2 - 15 is minus 13 and 10 -- 10 is zero. Similarly

we can add the two matrices and we get this as the answer

coming to addition and subtraction of a scalar to an

array. So when a scalar on or a number is added or

subtracted from an array, the scalar is added to or subtracted

from all the elements of the array. So here we'll look at

some examples. So, example one we have VecA given as this. So

VectA plus 4.is going to add 4 whichis a scalar and a number to each

of these individual elements of VectA. Similarly, in example two we have a matrix and from here from this matrix we are subtracting two, which means we're subtracting 2 from individual elements of the matrix. So here we get the result of A -- 2. Next will look at array multiplication, so multiplication operation is executed by using the estrik command in Matlab, and it follows the same rules of. Linear algebra, so these are some of the rules here. So if size of A is 4 cross three and size of B is 3 cross two that means the number of columns of A and the number of rows of B are same. Then only we can go ahead and multiply the two matrices. So the resultant that is A*B the product is going to have a dimension of four cross two, that is number of rows of A and number of columns of B. The product of multiplication of two square matrix is a square matrix of the same size and the last rule is multiplication of matrices is non-commutative. That is A into B is not equal to B into A. So here if we have A into B, where A is this matrix and B is this matrix then the first element of the first row is calculated as one into 5 + 4 into 1 + 3 into 2. The next element of the 1st way is calculated as one into 4 + 4

into 3. Plus 3 into 6.

The next element of the 2nd row is calculated as 2 into 5 + 6

into 1 + 1 into 2. The next element is as 2 into 4 + 6 into

3 + 1 into 6 and so on. This is going to give us the product of

the two matrices. Coming to an example, we have a matrix here

which is of four rows and three columns are matrix A and matrix

B is 3 rows and two columns, so definitely C which is a

product of A into B will have the dimensions of four rows and

two columns, so this is the product that we obtained.

Coming to array multiplication with the number. So here we can

multiply a number which is a scalar to a matrix, which is A.

So what happens when we do this? The scalar is multiplied to each

and every individual elements of the matrix A, so here 3 into A

will multiply B that is 3 with individual elements of the

matrix A. So here we have the resultant matrix which is stored

in the answer variables. So

here. 3 into 2 is 6. Three into five is 15. Three into seven is

21 and three into zero is 0. So accordingly we get the other

elements of the product. Next will look at Array division. Now

the division operator can be explained with the help of

identity matrix and the inverse operation. So the identity

matrix comprises of ones as the diagonal elements and zeros as the

other elements. So here A into I, where I is the identity

matrix is equal to I into A so that will give us the matrix itself. So the inverse operation

rule, that is one of the property is that A into A of

inverse is I, so these are some of the rules of inverse that is

not every matrix has are inverse and a matrix has an inverse if

and only if it is square and it's the determinant is not zero.

So in MATLAB the inverse of a matrix can be obtained by either

raising the matrix A to the power that is minus one.

Or by using the Matlab command that is Inv function. So this is

an example of using the INV function. So we have A as a

square matrix. That is a 3 cross 3 matrix and we have B which

is taking the inverse of a by using the Inv function of the

matrix of Matlab. So here we have inv of A which gives us

the inverse of A and in order to prove it we do A into A inverse

and into A inverse should give us the identity matrix.

And that's exactly what we get when we do A into B that is a

into A inverse, which will give us this identity matrix.

Coming to determinant, the determinant of a square matrix

can be calculated with the det command in Matlab. So if this is

the square matrix which is 3 cross three, then det of A is

going to find the determinant of the matrix A and give the result

as minus 6. Coming to types of array division. So Matlab has

two types of array divisions. There is the right division and

the left division the Left

division is represented by a back slash. It is used in order

to solve the matrix equation AX equal to B and In this equation

X & B are column vectors. So here if we take the solution that is

a X equal to B and we take A on the other side to get the

unknown, which is a vector X of column form, we get X = A

inverse B and this can be written as X = A left division

of be read from right to left it is B Divided by A.

Coming to right division. Here we have the

equation XA equals to B, where X is the solution of the linear

equations and here X & B are row vectors. Unlike in left division

where X & B were column vectors here they are column vectors. So here if

we take this equation and we take A inverse on both sides then

we get XA into A inverse equals B into A inverse. So BA inverse is I

So we have X = B into A inverse, so your X equal to B right

division A. So this is similar to B divided by A. Let's take

an example of solving three linear equations. So we have

here three equations, so we'll solve them by using two methods

will first solve them by using left division and we'll solve

them by using right division. So here the Matrix A is created by

putting the row elements as the coefficients of X,Y, Z.

The 2nd row will be coefficients again of the second equation and

the row three will be coefficients of the third equation

and the matrix B is going to be

8 4 0 in the column form. So here X = A left division B. So, we get

this as the solution of the equations where the first value

corresponds to X, second value corresponds to Y, and the third

value corresponds to Z. Here we have another method of doing

it. So we do inv of A into B, which will give us the same

answer and right division, we just rename the Matrix to C.

Which is similar to A and we take D Now as a row vector. So

here XC is equal to D right division C, so we get a row

vector as a answer and we get this X Y and Z respectively. Similarly we

can do the same thing by using the inv function in this way.

Coming to element by element operations we can do element by

element multiplication, division or exponentiation of two vectors

or matrices, that is done just by typing up period.

In front of the arithmetic operator. So we have a period

estrik for multiplication, period right division, period

left division and period exponentiation. So let's look at

how it is done. So for example we have two vectors A

which is a1, a2, a3 and a4 and vector B is b1,b2, b3 and b4. So a dot

estrik B is going to multiply, a1 with b1, a2 with b2, a3 with b3 and a4 with b4.

Next example is a dot right division b, so this is a1

divided by b1, a2 divided by b2, a3 divided by b3 and a4 / b4.

Similarly, we can do left division. Next, we have a dot

exponentiation B, so this is similar to a1 raised to be b1,

a2 raised to b2, a3 raised to b3 and a4 raised to b4. This

is the summary we looked at mathematical operations with

arrays array subtraction.

We did multiplication, array division an element by

element operations. The references are according to.