**Class 24**

**Key Ideas**

* Scalar operations on vectors and matrices
* Entire arrays can be passed to functions
* Array operations are performed element-by-element on corresponding elements of arrays (vectors or matrices) with the same dimensions
* Matrix multiplication
* Dimensions: in order to be able to multiply matrix A \* matrix B, if A has dimensions mxn, then B must have dimensions nxp. In other words, the number of rows of B must be the same as the number of columns of A (the inner dimensions agree). The resulting matrix will have dimensions mxp (the outer dimensions).
* Values: The elements in the product of A\*B are found as the sum of multiplying corresponding elements in the rows of A and columns of B.
* Note: matrix multiplication is NOT the same as array multiplication
* There are many properties of square matrices

**Built-ins**

**Functions**

Functions that change dimensions:

* **reshape**: changes the dimensions of a matrix
* **rot90**: rotates a matrix 90 degrees counterclockwise
* **fliplr**: flips the columns of a matrix left to right
* **flipud**: flips the rows of a matrix up to down
* **flip**: flips a row vector left to right, column vector or matrix up to down
* **repmat**: replicates an entire matrix
* **repelem**: replicates each element from a matrix

Array (Vector or Matrix) Functions:

* **min**: minimum value
* **max**: maximum value
* **sum**: sum
* **prod**: product
* **cumsum**: cumulative sum
* **cumprod**: cumulative product
* **cummin**: cumulative minimum
* **cummax**: cumulative maximum

Application:

* **diff**: returns differences between consecutive elements in a vector

Square matrices:

* **diag**: returns the diagonal of a matrix, or creates a matrix by putting a vector on the diagonal
* **trace**: the trace (sum of diagonal) of a square matrix
* **eye**: creates an Identity matrix
* **isdiag**: returns true if a matrix is a diagonal matrix
* **issymmetric**: returns true if a matrix is symmetric

Statistics:

* **mean**: average
* **mode**: number that appears most frequently
* **median**: number in the middle of a sorted vector
* **sort**: sorts a vector

**Operators**

Array operators:

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**Assessment Questions**

(T/**F**): If a vector variable *vec* has n elements, sum(vec) will result in a vector that has n elements.

If a vector variable *vec* has n elements, how many elements will the result of diff(vec) have? Choose one:

1

n

n-1

(Answer: n-1)