TECHNISCHE UNIVERSITÄT DRESDEN

INTRODUCTION TO MATLAB

Basic commands, variables and stuff

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00 Exercises

Define the following variables: $a = 3$, $b = -1$, $c = 7$, $d = -c$.

Evaluate the following:

1. $ab - c =$
2. $\frac{a+b}{c} =$
3. $a + \frac{b}{c} + d =$
4. $\frac{a+b}{c} + d =$
5. $\frac{a+b}{c+d} =$
6. $a - bc + 2^a + 2 =$

Add parenthesis to make the expressions clearer

1. a^b/2^c =
2. a*b^c*3 - d =

00 Unnecesary parenthesis

- ((a+b)^c)^d = (a+b)^c^d
- (a+b)^(c^d) = ?

00 Vectors

- For vectors A = [-2,-3,-5], B = [2;3;5].

  A' = $\begin{pmatrix} -2 \\ -3 \\ -5 \end{pmatrix}$ = [-2;-3;-5]

  (A')' = A = [-2,-3,-5] = -B'
- Evenly-spaced entries in a vector
  - C = 0:10:100
  - C = linspace(0,100,11)

00 Exercises for vectors

Define the vectors A = [-2,-3,-5], B = [2;3;5].

1. Find the sum of the elements of vector A.
2. The inner product in mathematics is defined, for two vectors X = [a,b,c] and Y = [d, e, f], as $X \cdot Y = ad + be + cf$. Find the inner product $A \cdot B$.

Define the vector C = [1, 2, ..., 1030]

1. Read out the first three and the last thirty elements of C. Name the result X. Then, X = [1,2,3,1001,1002,...,1030]
2. Read out all the even elements (divisible by 2) of C.
3. Read out all the odd elements (not divisible by 2) of C.
4. Create a vector Y with the elements of C in reverse order.
5. Replace the fifth, sixth, ..., twelfth elements of Y with the vector [10,15,...,45]

00 Concatenation of vectors and the fantabulous world of matrices

For two vectors, A = [1, 2, 3, 4, 5] and B = [7, 9, 10, 11, 12], concatenation means:

- D1 = [A, B] = [1, 2, 3, 4, 5, 7, 9, 10, 11, 12].
- D2 = [A; B] = $\begin{pmatrix} 1 & 2 & 3 & 4 & 6 \\ 7 & 9 & 10 & 11 & 12 \end{pmatrix}$
- D3 = [A',B'] = $\begin{pmatrix} 1 & 7 \\ 2 & 9 \\ 3 & 10 \\ 4 & 11 \\ 5 & 12 \end{pmatrix}$
- D4 = [A,B'] = ?

00 Matrix indexing

Matrices' elements are addressed with two ordered indices (row, column).

$$\begin{pmatrix} (1,1) & (1,2) & (1,3) \\ (2,1) & (2,2) & (2,3) \\ (3,1) & (3,2) & (3,3) \end{pmatrix}$$

For a matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 11 & 12 & 12 \\ 100 & 200 & 300 \end{pmatrix}$

A(1,2) = 2, A(3,3) = 300, etc.

00 Exercises with matrices

Define the three vectors A = [2, 4, 6,...,20], B = [-21, -20, ..., -12], C = zeros(1,10);

1. Create a matrix MatX whose rows are A, B and C, in that order.
2. Read out all the elements of the second row of MatX.
3. Read out the first five elements of rows one and two.
4. Replace the second column of MatX with zeroes using the command zeros(a,b).
5. Replace the element in the second row, third column, with $-\infty$.

00 Commands used

- help
- clc
- clear /clear all
- format short/long
- who, whos
- 6.022e23 (scientific notation)
- exp, sin, cos, ..., log, log10
- ‘ (transpose)
- linspace, 1:10:100
- size, length, numel