

Discrete mathematics

Test 2 – sample

Theory

Exercise A What does the theorem ‘Euclidean division for polynomials’ states?

Exercise B What is a partial permutation and in such a case how many possibilities do we have?

Exercise C Define the basis of a vector space and the coordinates of a vector with respect to a given basis.

Exercise D What is a homogeneous system of linear equations, and how does the solution space look like?

Practice

Exercise 1 Do Euclidean division on the polynomials below. Furthermore, use Horner’s method to calculate $p(2)$.

$$p(x) = 2x^4 - 3x^3 + 4x^2 - 5x + 6, \quad s(x) = x^2 - 3x + 1$$

Exercise 2 In how many ways can 8 people be arranged around a round table? What is the solution if two of them want to sit next to each other?

Exercise 3 In how many ways we can choose a group of 4 from 5 boys and 5 girls, such that there are exactly two girls among them?

Exercise 4 Consider the matrices below. What is the matrix $A \cdot B$ and A^T ?

$$A = \begin{pmatrix} -1 & 2 & 3 \\ 7 & 1 & 0 \end{pmatrix} \quad B = \begin{pmatrix} -2 \\ 0 \\ 4 \end{pmatrix}$$

Exercise 5 Calculate the determinant below.

$$\begin{vmatrix} -1 & 0 & 4 & 0 \\ 1 & 2 & 0 & -1 \\ 8 & 3 & -6 & 0 \\ 1 & -2 & 2 & 5 \end{vmatrix}$$

Exercise 6 Solve the following system of linear equations.

$$\begin{aligned} 2x + 5y + z &= 4 \\ -5x - 12y - 4z &= -1 \\ x + 3y - z &= 11 \end{aligned}$$

Exercise 7 Determine the inverse of the matrix A .

$$A = \begin{pmatrix} -4 & 9 \\ 1 & -3 \end{pmatrix}$$