LISTS OF QUESTIONS FOR THE MIDTERM TEST FOR THE COURSE MATH-ALGEBRA 1

1. Complex numbers. Basic operations, modulus, complex conjugate.

2. Polar (trigonometric) form of complex number. Multiplication and division in polar form. De Moivre's formula.

3. Powers and roots of complex numbers.

4. Vectors in $\mathbf{R}^2$ and $\mathbf{R}^3$: definition, multiplication by scalars, addition, modulus.

5. Scalar product of vectors in $\mathbf{R}^2$ and $\mathbf{R}^3$: definition, bilinearity, Cauchy-Schwartz inequality. Angle between two vectors.

6. Vector and mixed products in $\mathbf{R}^3$: definition, properties, associated formulae for areas and volumes.

7. Equation of a line in $\mathbf{R}^2$: parametric (directional), general (normal), and slope-intercept forms. Parametric equation of a line in $\mathbf{R}^3$

8. Equation of a plane in $\mathbf{R}^3$: parametric and general (normal) forms, equation in segments. Normal vector to a plane.

9. Vector space: definition, axioms, examples.

10. Linear combinations, spanning, and linear independence. Basis of a vector space. Dimension of a vector space.

11. Linear mappings between vector spaces. Matrix notation for linear mappings.

12. Matrices: definition, addition and multiplication. Properties of the matrix multiplication.

13. Systems of linear equations: matrix notation, elementary operations, the Gauss algorithm.

14. The rank of the matrix. Kernel and range of a linear mapping.

15. Homogeneous and non-homogeneous linear systems. The Kronecker-Capelli theorem.

16. Permutations and determinants: definitions. Minors and cofactors.

17. Laplace's formula for determinant.

18. Cramer's formulas.