**Müəllimin adı**: Samir Quliyev

**Fənnin adı**: Linear Algebra and Calculus

**Qrupun nömrəsi**: 1065

**Midterm Exam 1**

**Mövzu 1**: Systems of Linear Equations

**1.** Problem solving: Explaining why the system is consistent and finding a non-trivial solution to the system in the parametric form.

**2**. Problem solving: Solving the system of linear equations by each of the indicated methods.

**3**. Problem solving: Solving the system of linear equations using either Gaussian or Gauss-Jordan elimination procedure.

**4**. Problem solving: Determining the value(s) of $k$ such that the system of linear equations has exactly one solution, has no solution, has an infinite number of solutions.

**5**. Problem solving: Determining the value(s) of $k$ such that the following system of linear equations has exactly one solution, has no solution, has an infinite number of solutions.

**6**. Problem solving: Finding (if possible) conditions on *a, b,* and *c* such that the system of linear equations has exactly one solution, has no solution, has an infinite number of solutions.

**Mövzu 2**: Matrices

**1**. Problem solving: Proving formulas related to the trace of a matrix.

**2**. Problem solving: Solving problems related to matrix multiplication operation.

**3**. Problem solving: Solving problems related to the Leontief Input-Output Model.

**4**. Problem solving: Proving formulas related to homogeneous matrices.

**Mövzu 3**: Matrix Operations

**1**. Problem solving: Calculating the transposition of the product of two matrices.

**2**. Problem solving: Proving formulas related to symmetric matrices.

**3**. Problem solving: Proving formulas related to the product of two matrices.

**4**. Problem solving: Calculating the value of a function for a matrix argument.

**Mövzu 4**: Inverse Matrices

**1**. Problem solving: Solving several systems of linear equations, all of which have the same matrix of coefficients.

**2**. Problem solving: Determining the inverse of the matrix (if it exists).

**3**. Problem solving: Using the matrix inverse method to solve the system of linear equations.

**4**. Problem solving: Determining the minors and cofactors of the matrix and then building the adjoint matrix and calculating the inverse of the matrix.

**Mövzu 5**: Determinants and Eigenvalues

**1**. Problem solving: Finding the reduced row-echelon form of an $n×n$ matrix.

**2**. Problem solving: Finding the determinant of the matrix using expansion by cofactors and elementary row or column operations.

**3**. Problem solving: Verifying the determinant equation and using it as a model to find a determinant of another matrix.

**4**. Problem solving: Finding the determinant of the $n×n$ matrix.

**5**. Problem solving: Evaluating the determinants of the product of several matrices.

**6.** Problem solving: Using the determinant of the coefficient matrix to determine whether the system of linear equations has a unique solution. If it does, use Cramer’s Rule to find the solution.

**7.** Problem solving: Finding the eigenvalues of the matrix.

**Mövzu 6**: Geometric Method for Solving Linear Programming Problems

**1**. Problem solving: Solving a two-variable maximization problem using the geometric approach.

**2**. Problem solving: Solving a two-variable profit maximization problem using the geometric approach.

**Midterm Exam 2**

**Mövzu 1**: Geometric Method for Solving Linear Programming Problems

**1**. Problem Solving: solving minimization problem with two variables.

**2**. Problem Solving: solving maximization problem with two variables.

**3**. Problem Solving: deriving a set of inequalities to describe the region

**4**. Problem Solving: solving maximization problem with two variables.

**5**. Problem Solving: sketching the feasible solution space and describing the characteristic of the problem.

**6**. Problem Solving: Determining behavior of the objective function at different vertices.

**Mövzu 2**: Simplex Method for Solving Linear Programming Problems

**1**. Problem Solving: applying the simplex method to solve maximization problem.

**2**. Problem Solving: applying the simplex method to solve maximization problem.

**3**. Problem Solving: applying the simplex method to solve maximization problem.

**4**. Problem Solving: applying the simplex method to solve minimization problem.

**Mövzu 3**: Functions and Graphs

**1**. Problem Solving: finding the distance between the point and the line.

**2**. Problem Solving: finding the distance between the two lines.

**3**. Problem Solving: sketching the graph of the function.

**4**. Problem Solving: finding the minimal time of travel.

**5.** Problem Solving: calculating the perimeter of the region as a function of parameter.

**Mövzu 4**: Limit of a Function

**1**. Problem Solving: finding the limit of the function

**2**. Problem Solving: estimating the limit of the function

**3**. Problem Solving: determine the limit of the trigonometric function

**4**. Problem Solving: finding the values of the constants $a$ and $b$

**5**. Problem Solving: determine all values of the constant $a$ such the function is continuous for all real numbers

**Mövzu 5**: Limits and the Derivative

**1**. Problem Solving: find the point on the graph of the function where the tangent line has the greatest slope, and the point where the tangent line has the least slope.

**2**. Problem Solving: finding the dimensions of the rectangle of maximum area, with sides parallel to the coordinate axes, that can be inscribed in the given figure.

**3**. Problem Solving: analyzing symmetricity, $x-$ and $y-$intercepts, vertical asymptotes, horizontal asymptotes, etc. and sketching the graph of the function

**4**. Problem Solving: find the limit at infinity of the function.

**5**. Problem Solving: find an equation of the line that is tangent to the graph of the function and parallel to the given line.

**Final Exam**

**Mövzu 1**: Applications of Differentiation

**1**. Problem solving: evaluating the velocity of an object moving vertically or horizontally.

**2**. Problem solving: finding a point on a given interval at which the instantaneous rate of change of the function is equal to its average rate of change over the entire interval.

**3**. Problem solving: explaining why the function has a zero in the interval. Approximating the zero of the function in this interval.

**4**. Problem solving: solving the maximization problem for a single variable function.

**5**. Problem solving: solving the minimization problem for a single variable function.

**Mövzu 2**: Graphing and Optimization

**1**. Problem solving: finding the maximum and minimum points on the graph of the implicit function using Precalculus and Calculus techniques.

**2**. Problem solving: approximating relative extrema and asymptotes (both vertical and horizontal) of the function.

**3**. Problem solving: finding critical numbers (if any), the open intervals on which the function is increasing or decreasing, and the open intervals on which the function is concave downward and concave upward.

**4**. Problem solving: finding the extrema of the function on the interval.

**5**. Problem solving: finding a polynomial that fits the points.

**Mövzu 3**: Integration

**1**. Problem solving: finding the area of the region between the graph of the function and the $x$-axis over the given interval.

**2**. Problem solving: evaluate the definite integral of the algebraic function.

**3**. Problem solving: find the average value of the function over the given interval and all values of $x$ in the interval for which the function equals its average value.

**4**. Problem solving: proving the formula for definite integration.

**5**. Problem solving: finding the displacement and total distance of the particle over the time interval.

**Mövzu 4**: Applications of Integration

**1**. Problem solving: deriving the formula for definite integration.

**2**. Problem solving: finding the least-squares approximation of the function by another function.

**3**. Problem solving: find a solution of the differential equation.

**4**. Problem solving: determining the limit of the expression by using an appropriate Riemann sum.

**5**. Problem solving: solving the system of linear differential equations.

**Mövzu 5**: Taylor Polynomials and Approximations

**1**. Problem solving: using a power series to approximate the definite integral with an error of less than predefined number.

**2**. Problem solving: find the power series for the given function.

**3**. Problem solving: find the McLaurin polynomial whose value and first several derivatives agree with the value and first several derivatives of the given function at the prescribed point $x=0$.

**4**. Problem solving: find the Taylor polynomial of the specific degree whose value and first several derivatives agree with the value and first several derivatives of the given function.

**5**. Problem solving: estimate the value of the quantity by using the Taylor expansion polynomial of the function at the given point.