

AMATH 301 Winter 2024 Exam 1 Details

- Location and time: Section A: 8:30am - 9:20am KNE 210, Section B 9:30am - 10:20am KNE 130, Section C: 3:30pm to 4:20pm in Gowen Hall (GWN) 301
- Date: Friday 2-16
- When you arrive to the classroom on exam day, you must pick up an exam when you enter the classroom and then sit with one seat in between you and your neighbor if possible.
- You must sign the academic integrity pledge.
- Scratch paper will be distributed at the beginning of the exam (scratch paper cannot be turned in and graded).

Exam Details

- You will not be allowed a textbook, or a calculator on this exam.
- You will be allowed one side of an 8.5 by 11 inch sheet of paper for a note sheet. You may handwrite or type your note sheet, and you will be required to turn it in with your exam. All content of the note sheet must be written in English. **If your note sheet is on a larger sheet of paper or if it is double-sided, or if it is not entirely written in English, it may be taken from you during the exam.**
- Scratch paper will be provided, but any work that you would like to be graded must be written on the exam.
- There will be 5 problems on this exam.
- You will not need to code entire algorithms on this exam, you may be asked to write small blocks of code no longer than 3 lines. You will also likely be asked to analyze a given block of code. This could be in the form of explaining what a given block of python code may do when ran in the console, you may be asked to find and fix mistakes in a code, you may be asked what a code would output when ran in the console.

Problem Distribution and Summary of Material

The exam will cover sections materials from homework 2, 3, 4, and 5 which corresponds to material covered in lecture up to February 2.

- At least one problem from the following topics covered in Homework 2:
 - **Written topics from homework 2:**

- Matrix and vector operations: matrix and vector addition, subtraction, scalar multiplication, dot product of vectors, matrix multiplication, matrix vector multiplication, transpose of a matrix.
- Properties of matrix multiplication, Verify inverse matrix using the definition of an inverse matrix,
- Know the definition of a linear system of equations. Dimensions of a system of equations, A system of linear equations can have one solution, infinitely many solutions, or no solutions.
- **Coding topics from homework 2:**
 - numpy ndarrays, numpy functions, listed in homework 2, using the assignment operator with variables, using the numpy array, element-wise operators, representing vectors and matrices as vectors, variables in python, variable types, calculations in python.
- At least one problem from the following topics covered in Homework 3:
 - **Written topics from homework 3:**
 - Analyzing the output of python code, find and correct mistakes in code.
 - **Coding topics from homework 3:**
 - numpy ndarrays, plotting using matplotlib.pyplot, for loops, conditional statements, conditional statements and Boolean operations, matrix multiplication in python, numpy transpose, nested for loops, nested for loops for matrices.
- At least one problem will be from the topics covered in Homework 4:
 - **Written topics from homework 4:**
 - Naive Gaussian elimination, forward elimination, backward substitution, Elementary row operations, using pivoting by hand if necessary.
 - **Coding topics from homework 4:**
 - Homework 4 asked you to create a Gaussian elimination function in python. You may be asked how sections of the algorithm work in terms of output, you may need to fix mistakes with parts of the Gaussian elimination function given on the exam.
- At least one problem will be from the topics covered in Homework 5:
 - **Written topics from homework 5:**
 - Computational complexity, asymptotic computational complexity, LU decomposition by hand, forward and backward substitution, Richardson iteration method, Jacobi iteration method.
 - **Coding topics from homework 5:**

- Homework 5 asked you to create a forward substitution function in python and use a given LU factorization and a given backwards substitution factorization to solve systems of equations in python. You may be asked about how sections of the forwards substitution algorithm work, you may need to find and fix mistakes with parts of a forward substitution function given on the exam.