

Math 313 Exam 1 competencies

Exam Content

This exam will cover material specifically from sections 1.1 through 1.9. There will be three types of questions: multiple choice, fill in the blank and free response.

Multiple choice questions are right or wrong - there is no partial credit. There will be some limited space to work on but not a lot. Use scratch paper, or the back of a question in the free response section. Note that scratch paper will not be saved. Do not put work on scratch that you want me to look at. Please do not staple scratch paper to the exam.

Fill in the blank questions usually ask for answers that are short, and do not usually require much computation.

Free response questions will receive partial credit for partially correct work. Make sure your work is present in the space reserved for it. Otherwise you will receive no credit for the problem. Since the exam is double sided, you do not have access to the back. You can try things on scratch paper and then transfer your work to the exam, if you wish.

Some of the questions will be proofs. They will not be proofs of major theorems in the text. They will be similar to homework questions. Their intent is to see if you understand the definitions and theorems in the text and if you can apply them to a different question. Therefore it is important to know the theorems given in the text and in the homework. You can use them if they apply and if you are not asked to prove the theorem itself.

Practice Questions

In addition to your homework, you may want to try practice questions. Each Chapter has supplementary exercise. The ones for Chapter 1 are on pages 88-90, and that would be a good place to start. Be careful not to use questions from 1.6 or 1.10, however. You can also try problems in the book (that were not assigned) that test a specific concept.

Specific Learning Outcomes for Exam 1

1. Understand the geometric interpretation of systems of linear equations.
2. Understand what is meant by equivalent systems.
3. Know what an augmented matrix is.
4. Know the elementary row operations and how they can be used to solve systems of linear equations.
5. Understand and be able to use back substitution to solve a triangular augmented matrix.
6. Be able to use row operations to get a matrix into row echelon or reduced row echelon form. (Note: these terms are equivalent to echelon form and reduced echelon form.)

7. Understand what is meant by a **pivot**, **pivot column**, and **pivot row**. Understand what is meant by a free variable.
8. Understand what is meant by consistent, inconsistent, and dependent.
9. Be able to write the general solution to a dependent system as a vector function.
10. Be able to find linear combinations of vectors geometrically and algebraically.
11. Understand what is meant by **span** and **spanning set**.
12. Be able to determine if a specific vector is in a particular span.
13. Understand how consistency of $A\mathbf{x} = \mathbf{b}$ is tied to the span of the columns of A .
14. Be able to calculate Matrix-Vector multiplication.
15. Be able to write a system of equations in the form $A\mathbf{x} = \mathbf{b}$.
16. Understand how consistency of $A\mathbf{x} = \mathbf{b}$ is tied to the span of the columns of A .
17. Understand the properties of the homogeneous system $A\mathbf{x} = \mathbf{0}$.
18. Be able to describe the solution of the homogeneous system $A\mathbf{x} = \mathbf{0}$ as a span.
19. Understand how the solutions to $A\mathbf{x} = \mathbf{b}$ is related to $A\mathbf{x} = \mathbf{0}$.
20. Be able to use the number of pivots to understand the number of solutions of $A\mathbf{x} = \mathbf{0}$.
21. Be able to use the number of pivots to understand if $A\mathbf{x} = \mathbf{b}$ has a unique solution or if it is possible for it to be inconsistent.
22. Understand linear independence of vectors.
23. Be able to show whether a specific set of vectors is linearly independent.
24. Understand the theorems involving linear independence and linear dependence.
25. Understand what is meant by a linear transformation.
26. Be able to show whether a particular transformation is linear.
27. Understand matrix transformations.
28. Be able to graph the transform of a square in the plane.
29. Be able to find the matrix of any transformation.
30. Understand what is meant by 1-1 and onto.
31. Be able to show whether a linear transformation is 1-1 or onto.
32. Understand the relationship between a linear transformation and the pivots of its matrix.