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Mathematics 23a, Fall 2005

Theoretical Linear Algebra and Multivariable Calculus I

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Catalog Number: 5613
Exam Group: 4
Instructor: Alberto De Sole

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SYLLABUS (revised version: 11/15)

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Number systems. The real numbers.

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Monday, September 19

- Subject: *Overview of the course. Basics of the Theory of Sets*

Wednesday, September 21

- Subject: *Equivalence relations*

Friday, September 23

- Subject: *Fields axioms*

Monday, September 26

- Subject: *Ordered fields*

Wednesday, September 28

- Subject: *Completeness axiom of $\mathbb{R}$*

Friday, September 30

- Subject: *Mathematical induction*
- **Problem Set #1 due**

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Linear Algebra.

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Monday, October 3

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- Subject: *Vector spaces*
- Reading: Curtis, sec 3

Wednesday, October 5

- Subject: *Subspaces and linear span*
- Reading: Curtis, sec 4

Friday, October 7

- Subject: *Linear independence*
- Reading: Curtis, sec 5
- **Problem Set #2 due**

Monday, October 10

Columbus Day: no class

Wednesday, October 12

- Subject: *Basis and dimension*
- Reading: Curtis, sec 5

Friday, October 14

- Subject: *Facts about finite dimensional vector spaces*
- Reading: Curtis, sec 7
- **Problem Set #3 due**

Monday, October 17

Midterm Exam # 1

Wednesday, October 19

- Subject: *Systems of equations and linear algebra*
- Reading: Curtis, sec 8,9

Friday, October 21

- Subject: *Systems of equations: Gauss elimination*
- Reading: Curtis, sec 6,8,9

Monday, October 24

- Subject: *Linear transformations*
- Reading: Curtis, sec 11
- **Problem Set #4 due**

Wednesday, October 26

- Subject: *Linear transformations and matrices*
- Reading: Curtis, sec 12

Friday, October 28

- Subject: *Isomorphisms of vector spaces: matrix of a linear transformation*
- Reading: Curtis, sec 12-13

Monday, October 31

- Subject: *Change of basis formulas*
- Reading: Curtis, sec 13
- **Problem Set #5 due**

Wednesday, November 2

- Subject: *Determinant of a matrix*
- Reading: Curtis, sec 16

Friday, November 4

- Subject: *Properties of determinants*
- Reading: Curtis, sec 17

Monday, November 7

- Subject: *Properties of determinant, continued*
- Reading: Curtis, sec 17-18

Wednesday, November 9

- Subject: *Permutations formula for determinants*
- Reading: Curtis, sec 18-19
- **Problem Set #6 due**

Friday, November 11

> *Veteran's Day: no class*

Monday, November 14

- Subject: *The multiplication theorem for determinants*
- Reading: Curtis, sec 18-19

Wednesday, November 16

- Subject: *The study of a single linear transformation*
- Reading: Curtis, sec 22 (or Axler, chap 5)

Friday, November 18

- Subject: *Invariant subspaces, eigenvalues and eigenvectors*
- Reading: Curtis, sec 23 (or Axler, chap 5)
- **Problem Set #7 due**

Monday, November 21

- Subject: *Upper triangular matrices*
- Reading: Curtis, sec 24 (or Axler, chap 5)

Wednesday, November 23   **Midterm Exam # 2**

Friday, November 25

> *Thanksgiving break: no class*

Monday, November 28

- Subject: *Diagonal matrices*
- Reading: Curtis, sec 23-24 (or Axler, chap 5)

Wednesday, November 30

- Subject: *The characteristic polynomials and the minimal polynomial*
- Reading: Curtis (in part: 20-21) (or Axler, chap 8)

Friday, December 2

- Subject: *Jordan form*
- Reading: Curtis, sec 25 (or Axler, chap 8)

- **Problem Set #8 due**

Monday, December 5
- Subject: *Inner products*
- Reading: Curtis, sec 15 (or Axler, chap 6)

Wednesday, December 7
- Subject: *Orthonormal bases*
- Reading: Curtis, sec 15, 30 (or Axler, chap 6)

Friday, December 9
- Subject: *Self-adjoint and normal operators*
- Reading: Curtis, sec 30-31 (or Axler, chap 7)
- **Problem Set #9 due**

Monday, December 12
- Subject: *The spectral theorem*
- Reading: Curtis, sec 32 (or Axler, chap 7)

Wednesday, December 14
- Subject: *Positive definite operators*
- Reading: Axler, chap 7

Friday, December 16
- Subject: *Isometries*
- Reading: Axler, chap 7
- **Problem Set #10 due**

Monday, December 19
> *Review session*

Reading Period: January 3 – January 13
Final Examination Period: January 14 – January 24
The final exam is scheduled on: **Tuesday, January 24**.