

# Inhoud / Contents

## Lineaire Algebra / Linear Algebra 2DL06

### Cursus / Course 2009 - 2010

Version 21 October 2009

Information in this document can be changed.

The subject matter for the examination can be found in

- Elementary Linear Algebra, Bernard Kolman, David R. Hill, 9th edition, Pearson, Prentice Hall

The mentioned sections belong to the material for the examination unless indicated otherwise. Exercises have been selected for almost every section. The exercises constitute a minimal set to understand the subject matter. Make these exercises.

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## Contents

### ■ 1. Linear Equations and Matrices

#### □ 1.1 Systems of Linear Equations (EM)

Exercises: 3, 5, 7, 11, 13

#### □ 1.2 Matrices (EM)

Exercises: 5, 7, 9, 11

#### □ 1.3 Matrix Multiplication (EM)

Exercises: 3, 11, 16 a b, 19, 21, 23, 39

#### □ 1.4 Algebraic Properties of Matrix Operations (EM)

Exercises: 5, 7, 9, 23, 25

▣ **1.5 Special Types of Matrices and Partitioned matrices (EM)**

Exercises: 5, 9, 13, 15, 19, 22, 29, 35, 37, 50, 51

▣ **1.6 Matrix Transformations (EM)**

Exercises: 5, 7, 9, 15, 17

■ **2 Solving Linear Systems**

▣ **2.1 Echelon Form of a Matrix (EM)**

Exercises: 3, 7

▣ **2.2 Solving Linear Systems (EM)**

Exercises: 3, 5, 7, 11, 14, 21, 29

No subject matter for the examination:

- Applications, page 103 in the middle - page 108 at the top
- Application: Chemical Balance Equations, page 109 at the bottom - page 110 at the bottom

▣ **2.3 Elementary Matrices; Finding  $A^{-1}$  (EM)**

Exercises: 3, 9, 11, 16, 19, 22

▣ **2.4 Equivalent Matrices (EM)**

Exercises: 1, 3 a c, 6, 9

■ **3 Determinants**

▣ **3.1 Definition (EM)**

Exercises: 1, 3, 7, 11, 14, 16

▣ **3.2 Properties of Determinants (EM)**

Exercises: 2, 3, 5, 9, 10, 15, 18

No subject matter for the examination:

- Corollary 3.2

□ **3.3 Cofactor Expansion (EM)**

Exercises: 1, 3, 5, 9, 12, 15

□ **3.4 Inverse of a Matrix**

Exercises: 2, 4, 6, 7 b, 12

□ **3.5 Other Applications of Determinants (EM)**

You must know how to use Cramer's Rule, but you don't have to know the proof for the rule.

Exercises: 1, 3

■ **4 Real Vector Spaces**

□ **4.1 Vectors in the Plane and in 3-Space (EM)**

Exercises: 1, 3, 11, 13, 17

□ **4.2 Vector Spaces (EM)**

Exercises: 2, 7, 10, 25

□ **4.3 Subspaces (EM)**

Exercises: 2, 3, 5, 12, 13, 14, 23, 25, 26, 27, 29, 33

□ **4.4 Span (EM)**

Exercises: 4, 6, 10, 11, 13, 14

No subject matter for the examination:

- Example 2, 3, 7, 9

□ **4.5 Linear Independence (EM)**

Exercises: 3, 10, 11, 16, 21, 22, 25, 28

□ **4.6 Basis and Dimension (EM)**

Exercises: 2, 6, 7, 11, 14, 15, 19 a, 28, 35, 42

□ **4.7 Homogeneous Systems (EM)**

Exercises: 1, 5, 14, 22, 23, 25, 26

▣ **4.8 Coordinates and Isomorphisms**

Exercises: ??

▣ **4.9 Rank of a Matrix (EM)**

Exercises: 1, 5, 7, 9 a, 11, 16 a, 19 a, 27, 34, 35, 37, 44

■ **5 Inner Product Spaces**

▣ **5.1 Length and Direction in  $\mathbb{R}^2$  and  $\mathbb{R}^3$  (EM)**

Exercises: 6 a, 7, 9, 11 a, 18, 25, 32

▣ **5.2 Cross Product in  $\mathbb{R}^3$  (EM)**

Exercises: 1, 7, 9, 13, 15, 19 a, 23, 25

▣ **5.3 Inner Product Spaces (EM)**

Exercises: 1, 7, 9 a c, 19, 29, 33, 40

No subject matter for the examination:

- Example 2, 4, 6, 9, 11, 14

▣ **5.4 Gram-Schmidt Process (EM)**

Exercises: 9, 11, 13, 28

No subject matter for the examination:

- Example 3
- QR-Factorization, page 326 at the bottom - page 329 at the bottom

▣ **5.5 Orthogonal Complements**

Exercises: 1, 3, 9, 11 a, 14 a, 15

No subject matter for the examination:

- Example 2
- Fourier Series (Calculus Required), page 343 at the bottom - page 347 at the bottom

## ■ 7 Eigenvalues and Eigenvectors

### □ 7.1 Eigenvalues and Eigenvectors (EM)

Exercises: 5, 7, 17, 20

No subject matter for the examination:

- Examples 7, 8, 9, 14

### □ 7.2 Diagonalization and Similar matrices (EM)

Exercises: 6, 8, 12, 13

No subject matter for the examination:

- Examples 1 and 7

### □ 7.3 Diagonalization of Symmetric Matrices (EM)

Exercises: 1, 2, 8, 15, 17, 18, 19

No subject matter for the examination:

- Application: The Image of the Unit Circle by a Symmetric Matrix, page 472 - page 475