

Plan: M0030M, LP2, 2018

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Course Literature:

- R A Adams and C Essex (hereafter referred to as **A&E**)
Calculus, ninth Edition.
- D C Lay, S R Lay and J J Mc Donald (hereafter referred to as **LL&M**)
Linear Algebra and its applications, fifth edition, 2015/2016.
- M Euler and N Euler (hereafter referred to as **E&E**)
Problems, Theory and Solutions, Part 1: Euclidean Space (second edition)
[Free online access to this ebook is available from the direct link:
<http://bookboon.com/se/problems-theory-and-solutions-in-linear-algebra-ebook>]

Computer Lab in Maple:

This course also includes exercises in Maple. The Maple exercises and instructions are provided towards the end of this document. An introduction to Maple is given in Appendix A in **E&E**.

Lectures on Linear Algebra:

Lecture 1. *Vectors and coordinates in 3-space:* §10.1–10.2 (**A&E**)

Lecture 2. *Vectors and coordinates in 3-space:* §10.2 (**A&E**)

Lecture 3. *The cross product:* §10.3 (**A&E**)

Lecture 4. *The cross product/lines and planes in \mathbb{R}^3 :* §10.3/10.4 (**A&E**)

Lecture 5. *More on planes and lines in \mathbb{R}^3 :* §10.4 (**A&E**)

Lecture 6. *More on planes and lines in \mathbb{R}^3 :* §1.5 (**E&E**)

Lecture 7. *Introduction to Maple:* Appendix A in **E&E**

Lecture 8. *Systems of linear equations:* §1.1 and §1.2 (**LL&M**)

Lecture 9. *Vector equations and Matrix equations:* §1.3 and 1.4 (**LL&M**)

Lecture 10. *Solutions of systems of linear equation:* §1.5 (**LL&M**)

Lecture 11. Reserve

Lecture 12. *Linearly independent set and Linear transformations:* §1.7 and §1.8 (**LL&M**)

Lecture 13. *Linear transformations and standard matrices:* §1.8 and §1.9 (**LL&M**)

Lecture 14. *Matrix operations and Inverse of square matrices:* §2.1 and §2.2 (**LL&M**)

Lecture 15. *Invertible transformations:* §2.3 (**LL&M**)

Lecture 16. *More on Linear Transformations:* §4.1, §4.2, §4.3 (**E&E**)

Lecture 17. *Determinants:* §3.1 and §3.2 (**LL&M**)

Lecture 18. *More on determinants and Cramer's rule:* §3.3 (**LL&M**) and §2.5 (**E&E**)

Lecture 19. Reserve

Lectures on Integral Calculus:

Lecture 20. *Area and of limits of sums:* §5.1–5.2 (**A&E**)

Lecture 21. *Riemann sums and the definite integral:* §5.3 (**A&E**)

Lecture 22. *Properties of the definite integral:* §5.4 (**A&E**)

Lecture 23. *The fundamental theorem of calculus:* §5.5 (**A&E**)

Lecture 24. *The method of substitution:* §5.6 (**A&E**)

Lecture 25. *The area of a plane region:* §5.7 (**A&E**)

Lecture 26. Reserve

Lecture 27. *Integration by parts:* §6.1 (**A&E**)

Lecture 28. *Integration of rational functions:* §6.2 (**A&E**)

Lecture 29. *Inverse substitution:* §6.3 (**A&E**)

Lecture 30. *Improper integrals:* §6.5 (**A&E**)

Lecture 31. Reserve

Lecture 32. *Solids of revolution: Volumes by slicing:* §7.1 (A&E)

Lecture 33. *Solids of revolution: Volumes by slicing:* §7.2 (A&E)

Lecture 34. *Arc length and surface area:* §7.3 (A&E)

Lecture 35. *Parametric curves:* §8.2 (A&E)

Lecture 36. *Smooth parametric curves and their slopes:* §8.3, (A&E)

Lecture 37. *Arc length and area
of parametric curves:* §8.4 (A&E)

Lecture 38. Reserves

Recommended Exercises and Repetitions:

Linear Algebra:

Exercises **10.1 (A&E):** 1, 3, 6, 9, 13, 15, 23.

Exercises **10.2 (A&E):** 1a, 1f, 1h, 2, 3, 13.

Repetition on the dot product (E&E §1.1):

Work through the solved Problems in **Section 1.1**.
Do **Exercises 1.6:** 1a, 1b, 1c, 1d, 1e, 1f.

Exercises **10.3 (A&E):** 1, 3, 4, 5, 7, 9, 13, 17.

Repetition on the cross product (E&E §1.2):

Work through the solved Problems in **Section 1.2**.
Do **Exercises 1.6:** 2, 3.

Exercises **10.4 (A&E):** 3, 4, 5, 7, 9, 15, 17, 21, 27, 28, 29.

Repetition on planes and lines (E&E §1.3, §1.4, §1.5):

Work through the solved Problems in **Sections 1.3, 1.4, 1.5**.
Do **Exercises 1.6:** 5, 7, 8, 9, 10.

Exercises **1.1 (LL&M)**: 1, 7, 9, 11, 13, 15, 17, 19.

Exercises **1.2 (LL&M)**: 1, 3, 7, 11, 17, 19, 23,, 24 25, 29, 31.

Exercises **1.3 (LL&M)**: 5, 9, 11, 13, 15, 17, 20, 21.

Exercises **1.4 (LL&M)**: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21.

Exercises **1.5 (LL&M)**: 1, 3, 5, 7, 11, 13

Repetition on Gauss elimination (E&E §2.4, §2.6 and §2.7):

Work through the solved Problems in **Sections 2.4, 2.6 and 2.7**.
Do **Exercises 2.8**: 6, 7, 9, 11, 14a, 17.

Exercises **1.7 (LL&M)**: 1, 5, 9, 13, 33, 35, 37.

Repetition on Spanning Sets

and Linearly Independent Sets (E&E §3.1, §3.2 and §3.3):

Work through the solved Problems in **Sections 3.1, 3.2 and 3.3**.
Do **Exercises 3.4**: 2, 3, 5, 6, 8.

Exercises **1.8 (LL&M)**: 1, 3, 5, 9, 11, 17, 19, 32.

Exercises **1.9 (LL&M)**: 1, 3, 5, 7, 19, 21.

Exercises **2.1 (LL&M)**: 1, 3, 5, 7, 9.

Exercises **2.2 (LL&M)**: 1, 5, 7, 19, 31, 32.

Exercises **2.3 (LL&M)**: 1,3, 7, 33.

Repetition on Linear Transformations

and Standard Matrices (E&E §4.1, §4.2 and §4.3):

Work through the solved Problems in **Sections 4.1, 4.2 and 4.3**.
Do **Exercises 4.4**: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13.

Exercises **3.1 (LL&M)**: 1, 11, 25, 27, 41.

Exercises **3.2 (LL&M)**: 5, 9, 19, 25, 29, 31, 42

Exercises **3.3 (LL&M)**: 3, 5, 7, 19, 27.

Repetition on Matrix Operations, Determinants

and Cramer's Rule (E&E §2.1, §2.2, §2.3, §2.5):

Work through the solved Problems in **Sections 2.1, 2.2, 2.3 and 2.5..**

Do **Exercises 2.8**: 1, 3, 4, 5, 12.

Integral Calculus

Exercises **5.1 (A&E)**: 1, 9, 21.

Exercises **5.2 (A&E)**: 1, 5, 9.

Exercises **5.3 (A&E)**: 1, 9, 11, 13.

Exercises **5.4 (A&E)**: 1, 3, 7, 13, 15, 27, 29, 33.

Exercises **5.5 (A&E)**: 7, 11, 13, 15, 17, 21, 23, 25, 27, 28, 31, 33, 39, 41.

Exercises **5.6 (A&E)**: 1, 3, 5, 7, 9, 13, 15, 21, 23, 27, 41, 43, 47.

Exercises **5.7 (A&E)**: 3, 5, 7, 9, 11, 13, 15, 17, 18, 25, 29.

Exercises **6.1 (A&E)**: 1, 3, 5, 7, 9, 13, 21, 23, 29, 31.

Exercises **6.2 (A&E)**: 1, 3, 5, 7, 9, 11, 13, 15, 17, 23, 25, 30, 31.

Exercises **6.3 (A&E)**: 1, 3, 5, 9, 11, 17, 29, 31, 41, 43, 45.

Exercises **6.5 (A&E)**: 1, 5, 9, 15, 19, 23, 25, 31, 33, 41.

Exercises **7.1 (A&E)**: 1, 3, 5, 7, 9, 11, 21.

Exercises **7.2 (A&E)**: 1, 3, 5, 11.

Exercises **7.3 (A&E)**: 1, 3, 5, 7, 9, 11, 22, 23, 26.

Exercises **8.2 (A&E)**: 3, 5, 13.

Exercises **8.3 (A&E)**: 1, 3, 5, 7, 9, 11, 13

Exercises **8.4 (A&E)**: 1, 3, 5, 7, 9, 10, 11, 13

Repetition on Methods of Integration

See Appendix B in

N Euler **A first course in ordinary differential equations**, July 2015

[Free online access to this ebook is available at bookboon.com by the following direct link:
bookboon.com/se/a-first-course-in-ordinary-differential-equations-ebook]

Maple Exercises in Linear Algebra:

Use Maple to solve the following four Problems and write your results and explanations clearly in a written presentation. Please follow the *Rules and Instructions* as listed below.

You'll find the following Exercises in **E&E: Problems, Theory and Solutions, Part 1: Euclidean Space**. **An introduction to Maple is given in Appendix A**

Problem 1: §2.8. Exercise 8.

Problem 2: §3.4. Exercise 9a.

Problem 3: §4.4. Exercise 18.

[**Hint:** Work through the solved **Problem 4.2.9**.

Regler och instruktioner för Maple-momentet:

1. För att bli godkänd på Maple-momentet av kursen M0030M måste studenterna lösa uppgifterna i detta dokument med hjälp av Maple.
2. Studenterna får jobba enskilt eller i en grupp bestående av högst tre personer. Studenterna förväntas kunna lösa uppgifterna på egen hand.
3. Flera laborationer har blivit schemalagda för denna kurs.
4. Det finns bara två betyg på detta moment. Studenterna kan antingen bli godkända eller icke godkända. För att bli godkänd måste studenterna lösa alla problem korrekt och presentera resultatet väl i en skriftlig redogörelse. Det är viktigt att studenterna anger sin e-post adress i den skriftliga redogörelsen, skriver datum för inlämningen och sitt fullständiga namn, samt vilket program de studerar, t.ex. Rymdteknik. Studenternas lärare bestämmer hur rapporten skickas in, t.ex. bifogad i mail eller utskrivna på papper. Varje lärare kommer att ge instruktioner under lektionen hur studenterna ska lämna in den skriftliga redogörelsen. **OBS! Skriftlig redogörelse kan ej bli inskickad via canvas.** Rättningen och bedömningen av studenternas skriftlig redogörelse kommer att utföras av läraren som undervisar gruppen. Om läraren inte är nöjd med skriftlig redogörelse så kommer hen att ge dessa studenter instruktioner för förbättringar.

5. Varje lärare har en skyldighet att rapportera in varje misstanke om fusk till disciplinnämnden för vidare utredning och åtgärder. Följande är ett exempel på fusk. Varje form av kopiering av resultat och lösningssteg till någon av uppgifterna från laborationen. Detta gäller såväl kopiering av andra personers lösningar och lösningar som möjligen kan hittas på internet.
6. Alla studenter ska lämna in sina skriftliga redogörelser senast den **15 december 2018**. Inga skriftliga redogörelser kommer att tas emot efter 15 december 2018. Den student som inte lämnar in sin rapport senast detta datum kommer automatiskt att bli underkänd denna omgång.

Rules and Instructions for the Maple assignments:

1. Students must solve the Maple problems listed in this document by using the program Maple.
2. Students can work in groups consisting of maximum three student members and hand in a joint written presentation. The students are expected to make use of the information given in the Appendix in **E&E** and the online help included in the Maple package which is installed on the LTU computers.
3. Several lab sessions have been scheduled for this course in the E-building and students can attend any of those sessions, provided space is available in the computer room. Please visit the LTU schema website for details on the lab schedule.
4. Two grades are possible for the Maple computer lab, namely a *Pass* or a *Fail*. In order to pass the Maple computer lab the student must solve the listed problems correctly and present the results neatly in a written presentation. **The written presentation should contain all Maple steps used in solving the problems and the solutions should moreover be described in the written presentation. Students can use “Word” or “Latex” to write their written presentation.** Students must write their full name and surname, a contact email address, the date of submission, as well as the programme in which they are studying, e.g. *Rymdteknik*, on the front page of their written presentation. The form of submission, i.e. in printer form or as an attachment by email, will be determined by the particular teacher. Most teachers prefer a paper printed version of the written presentation, but exact information regarding the submission will be given by the teacher during the lecture. **Please note that the written presentations should not be submitted via the canvas system.** The evaluation and grading of the written presentations will be done by the teacher who is responsible for the particular group that he/she is teaching. If the teacher is not satisfied with the solutions handed in by the student(s), then the teacher will provide the student(s) with instructions for improvements.
5. Teachers are obliged to report any suspected foul play of the laboration to the university disciplinary office for further investigation and conviction. The following is an examples of foul play of the laboration: the copying, in any form or by any

means, of results or program steps of the solutions of any hereby listed exercise, from other persons or student participants or from an internet site.

6. All students must submit their written presentations to their teacher at the latest on the **15th of December 2017. No lab results will be accepted after this date.** Those students that have not handed in their written presentations by this date will automatically fail this Maple computer lab. The next opportunity to do the Maple computer lab will then be in May 2018 and different exercises will be provided.