

MATH1014, Linear Algebra Syllabus

This syllabus aims to let you know what will be covered in Linear Algebra this semester, and some idea of when topics will be covered, although it is possible that some of the timing will change a little.

- Week 1
 1. Vectors in \mathbb{R}^2 and \mathbb{R}^3 , the dot product and projections, vectors in \mathbb{R}^n – Adams 10.2.
 2. The cross product in \mathbb{R}^3 , the cross product as a determinant – Adams 10.3
- Week 2
 1. Planes and lines in \mathbb{R}^3 – Adams 10.4
 2. Distances - from a point to a plane, from a point to a line – Adams 10.4
- Week 3
 1. Vector spaces and subspaces – Lay 4.1.
 2. Null spaces, column spaces and linear transformations – Lay 4.2.
- Week 4
 1. Linearly independent sets, bases – Lay 4.3
 2. Coordinate systems with respect to a basis – Lay 4.4
- Week 5
 1. Holiday
 2. The dimension of a vector space – Lay 4.5
- Week 6
 1. Rank of a matrix – Lay 4.6
 2. Change of basis – Lay 4.7
- Week 7
 1. Applications to difference equations – Lay 4.8
 2. Applications to Markov chains – Lay 4.9
- Week 8
 1. Eigenvectors and eigenvalues – Lay 5.1
 2. The characteristic equation, diagonalisation – Lay 5.2, 5.3

- Week 9
 1. Diagonalisation continued, eigenvectors and linear transformations – Lay 5.3, 54.
 2. Complex eigenvalues – Lay 5.5
- Week 10
 1. Discrete dynamical systems – Lay 5.6
 2. Inner products and orthogonality – Lay 6.1
- Week 11
 1. Orthogonal sets – Lay 6.2
 2. Orthogonal projections – Lay 6.3
- Week 12
 1. The Gram-Schmidt process, QR factorisation – Lay 6.4
 2. Least squares problems – Lay 6.5
- Week 13
 1. Revision
 2. and more revision.

Calculus Syllabus (2006) – week by week

Week 1

1. Substitution method, Integration by Parts (reviewed)
Adams 5.6 (page 334-335), Adams 6.1 (page 349-352)
2. Reduction Formulae- Adams 6.1 (page 353-355)
Inverse Substitutions-Adams 6.2 (page 356-360)

Week 2

1. Integrals of rational functions-Adams 6.3 (page 364-372)
2. Improper integrals (first kind)-Adams 6.5 (page 376-379)

Week 3

1. Improper integrals (second kind)-Adams 6.5 (page 379-382)
2. Numerical methods of integration- Adams 6.6,6.7 (page 385-397)

Week 4

1. Applications of Integration: Volumes of solids of revolution
-Adams 7.1 (page 407-417)
Arc length and surface area - Adams 7.3 (page 421-429)
2. Parametric curves – Adams 8.2 (page 488-496)

Week 5

1. Parametric curves: Slope and Concavity) –Adams 8.3 (page 496-500)
2. Parametric curves: Arclength and Area –Adams 8.4 (page 500-505)

Week 6

1. Polar curves - Adams 8.5 (page 505-510), Adams 8.6 (page 512-518)
2. Sequences -Adams 9.1 (page 519-527)

Week 7

1. Infinite Series –Adams 9.2 (page 527-535)
2. Infinite Series: Convergence tests for positive series-Adams 9.2 (page 535-546)
Absolute and Conditional convergence- Adams 9.4 (Page 546-553)

Week 8

1. Power Series –Adams 9.5 (page 554 -565)
Taylor and McLaurin Series-Adams 9.6 (page 565-573)
2. Binomial Theorem and Binomial Series – Adams 9.9 (page 581-584)
Applications-Adams 9.7 (page 573-577)

Week 9

1. Functions of Several Variables: Visualisation, Partial Derivatives
–Adams 12.1-12.4, (page 705-721, page 726-728)
2. Functions of Several Variables; Chain rule-Adams 12.5 (page 732-738)
Functions of Several Variables: Differentials, Approximation
-Adams 12.6 (page 743-745)

Week 10

1. Functions of Several Variables: Extreme Values-Adams 13.1,13.2
(page 783-785, page 788-795)
2. Gradient and Directional derivative- Adams 12.7 (page 751-757)

Week 11

1. Multiple Integration: Double Integrals –Adams 14.1 (page 836-842)
2. Multiple Integration: Iteration of double integrals-Adams 14.2 (page 842-849)
Changing the order of integration Adams- 14.2, Example 3 (page 847)

Week 12

1. Finding extrema with constraints –Adams 13.3
2. The Lagrange Multiplier Method – Adams 13.3 (page 798-803)

Week 13

1. Revision
2. Revision