

Numerical analysis extra questions

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September 2024

These are notes and extra questions for the Part A (second year) course numerical analysis taught in Hilary term (January-March) in Oxford.

1 Good resources

I highly recommend An intro to numerical analysis [1]. Everything I reference will be from [1] unless specified otherwise.

2 Interpolating polynomials

Reading: Section 6 covers all the material plus some more on Hermite polynomials.

Questions: I recommend doing all questions at the end of section 6 (pg 195). Although the questions especially relevant for marking would be Q6.4-Q6.9, Q6.10, Q6.12.

3 LU factorisation

Reading: I recommend reading through section 2 of [1] to understand LU factorisation. The course in Oxford mostly covers sections 2.2-2.5.

Questions: As for questions I recommend Q2.1-Q2.6 (pg 82) which follow the course.

Computational questions: It is also a good exercise to implement a function which computes the LU factorisation using your favourite programming language. The input would be a square $n \times n$ matrix A and the output is 2 $n \times n$ matrices L and U which is the LU factorisation. Once that has been implemented, implement a function a function which takes as input L and U and a vector b and returns x such that $LUx = b$.

3.1 Condition number

To learn about condition number, read sections 2.6-2.8 and do Q2.7-2.14 at end of chapter.

References

- [1] Endre Süli and D. F. (David Francis) Mayers. *An introduction to numerical analysis*. Cambridge University Press, Cambridge, 2006.