AA1H, Assignment 2

You may talk to others about the problems. But you are expected to write out the solutions yourself, with no one else indicating what to write, and without help from anyone elses notes. If someone else had a major input into your solution, you should indicate this.

The assignment is due in by April 9, Friday 4pm (**NOT** 5pm as indicated in the general information sheet), in the AA1H collection box corresponding to your tutorial group, in the foyer of the Mathematics Department.

Mathematics is the ultimate form of careful and precise argument.

- Keep your answers brief and to the point.
- Reread the remarks in Assignment 1 on setting out a proof.
- Study the solutions to Assignment 1 both for content and style.
- There masy be some material needed for the assignment which was not covered explicitly in class. But it *is* all in the appropriate Sections of the Notes or of Lay.

Exercise 1.

- Read my TEX'd notes on Linear Algebra to the end of Section 1.3.
- Study Lay to the end of Section 1.3, *particularly* the Examples..
- Study Section 4.1 in Lay to the end of Example 9.
- Read Section 2.6 of the AA1H 1998 Calculus Notes.
- Read the AA1H 1999 Calculus Notes to the end of Section 4.2.

HINT: For the following, note that the answers to similar odd numbered exercises are in the back of the text.

Exercise 2. Lay, Q30 p11, Q32 page 12.

Exercise 3. Lay, Q22 p25. *First* find the reduced row echelon form. *Then* answer the question.

Exercise 4. Read and understand the solution to Lay, Q31, 33 p26. Do Lay, Q32 p26.

Exercise 5. Lay, Q 6, 8, p217.

Exercise 6. Lay, Q 26, 28, p217.

Note that Lay takes a slightly different version of the Axioms. If you look at his axioms on p211 and compare with mine, I did not include "Axioms 1, 6" explicitly, but I did include them implicitly; see lines 14 and 15 from the bottom of p9 of my notes on linear algebra.

He also takes a slightly different form of his Axiom 5.

Use the version in Lay for these exercises.

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Exercise 7. Use a calculator or otherwise to compute enough terms of the following sequences to guess what their limits are. Note that "angles" are measured in radians, not degrees. For example, $\sin \pi/4 = 1/\sqrt{2}$.

1. $a_n = n \sin \frac{1}{n}$,
2. $a_n = (1 + \frac{1}{n})^n$,
3. $a_{n+1} = \frac{1}{2} a_n + 2,\ a_1 = .5$,
4. $a_{n+1} = 2.5 a_n (1 - a_n),\ a_1 = 3$.

Exercise 8. Prove directly that each of the following sequences converges by letting $\epsilon > 0$ be given and finding N such that (4.1), on p4 of the AA1H 1999 Notes, holds.

1. $a_n = 1 + \frac{10}{\sqrt{n}}$,
2. $a_n = 1 + \frac{1}{\sqrt[3]{n}}$,
3. $a_n = 3 + 2^{-n}$,
4. $a_n = \sqrt{\frac{n}{n+1}}$.