Homework for Math 320
Fall 2015

Textbook:

Understanding analysis, by Stephen Abbott, First edition

Homework for week 09/02-09/04:
Due Wednesday 09/09
09/02: Chapter 1.2: exercises 3,4,7 and 8
09/04: Chapter 1.2: exercise 1, Chapter 1.3: exercises 3 and 6

Homework for week 09/09-09/11:
Due Monday 09/14
09/09: Chapter 1.4: exercises 2,5 and 12; Chapter 1.5: exercise 1
(for the second edition: Chapter 1.4: exercise 1 and 2, Chapter 1.5: exercise 9, Chapter 1.6: exercise 1)
09/11: Chapter 2.3: 2,3,5 and 11
(for the second edition: Chapter 2.3: 1,3,5, and 11)

1st Quizz on Wednesday 09/16

Homework for week 09/14-09/18:
Due Monday 09/21
09/14: Chapter 2.4: exercises 2,4,5 and 6
(for the second edition: Chapter 2.4: exercises 1,3,5 and 7)
09/16: Chapter 2.5: exercises 3(a-c-e),4 and 6
(for the second edition: Chapter 2.5: exercises 1(a-b-c),5 and 6
09/18: Chapter 2.6: exercises 1,3 and 5
(for the second edition: Chapter 2.6: exercises 2,3 and 5)

Homework for week 09/21-09/25:
Due Monday 09/28
09/21: Chapter 2.7: exercises 9-10-11
(for the second edition: Chapter 2.7: exercises 7-9-11)
and supplementary exercise:
Discuss the convergence of the series
(a) $\sum_{n\in\mathbb{N}} \frac{\sin n}{n^2}$ (b) $\sum_{n\in\mathbb{N}} \frac{(-1)^n}{n-\log n}$ (c) $\sum_{n\in\mathbb{N}} n\left(\frac{1}{2}\right)^n$
09/23: Chapter 2.8: exercises 2 and 8 (or 2 and 7 for the second edition),
and Chapter 3.2: exercise 3
09/25: Chapter 3.2: exercises 9 and 14 (or 11 and 15 for the second edition),
and Chapter 3.3: exercise 1

2nd Quizz on Wednesday 09/30

Homework for week 09/28-10/02:
This week's homework won't be graded
09/28: Chapter 3.3: exercises 5(bf)-7 and 10 (or 2(be)-5 and 13 for the second edition), and Chapter 3.4: exercise 5
10/02: Chapter 3.5: exercise 9

Exercise session on Monday 10/05
We will work in class on the following exercises: Chapter 2.7: exercises 13-14 (both editions),
Chapter 3.3: 7abc and 10 in the first edition, 5acd and 13 in the second edition
Chapter 3.4: 8 and 10 in the first edition, 7 and 9 in the second edition
and the following exercise:
Let (u_n) be the sequence defined by $u_0 = \frac{3}{2}$ and

$$u_{n+1} = \log u_n + 1$$

Show that u_n is well defined and converges, find the limit of u_n.

1st Midterm exam on Wednesday 10/07
Covers: Chapter 1 and 2, Chapter 3: 3.1 to 3.4

Homework for week 10/09-10/16:
Due Monday 10/19
10/09: Chapter 4.2: exercises 1 and 6 (first edition) or 5 and 7 (second edition)
10/12: Chapter 4.4: exercises 1, 6 and 11 (both editions)
10/14: Chapter 4.5: exercises 2,3 and 7 (first edition) or 2 and 7 (second edition)
10/16: Chapter 4.6: exercises 7,9 and 10 (first) or 8,10 and 11 (second edition)

25 min Superquizz on Wednesday 10/14
Covers: Same material as the Midterm 1. The grade for this quizz will count instead of Midterm 1 if it is higher.

Homework for week 10/19-10/23:
Due Monday 10/26
10/19: Chapter 5.2: exercises 4,5 and 6 (first edition) or 5,7 and 11 (second edition)
10/21: Chapter 5.3: exercises 1,3,5 and 8 (first edition) or 1a,3,7 and 8

3rd Quizz (15min) on Wednesday 10/28
Covers: Chapter 4 and 5: Continuity and the derivative of a function

Homework for week 10/26-10/30:
Due Monday 11/02
10/26: Chapter 6.2: exercises 1,3,11 and 12 (first edition) or 1,3,9 and 11 (second edition)
10/28: Chapter 6.2: exercises 4 and 10, Chapter 6.3: exercises 3 and 4 (first edition)
or Chapter 6.2: exercise 7 and Chapter 6.3: exercises 3 and 4 (second edition)

2nd Midterm exam on Wednesday 11/11
Covers: Chapter 4 and 5, Chapter 6: 6.1 to 6.4.
List of exercises you can work on to prepare for the exam:
1st edition : Chap 4.3: ex 7, Chap 4.5: ex 7, Chap 5.3: ex 1 and 2, Chap 6.2: ex 12, Chap 6.3: ex 1, Chap 6.4: ex 5 and 7
2nd edition : Chap 4.3: ex 9, Chap 4.5: ex 7, Chap 5.3: ex 1, Chap 6.2: ex 11, Chap 6.3: ex 4, Chap 6.4: ex 7 and 9
Supplementary exercises:
Exercise 1:
For each proposition, either prove it is true or provide a counterexample:
(a) If f_n are continuous on a compact set $K \subset \mathbb{R}$ and $f_n \to f$ pointwise on K, then the convergence is uniform
(b) If $f_n \to f$ uniformly on A, and f_n are bounded on A, then f is bounded.
(c) If $f_n \to f$ uniformly on A and g is bounded then $f_n g \to fg$ uniformly on A
(d) If $f_n \to f$ uniformly on A and $f_n \to f$ uniformly on B, then $f_n \to f$ uniformly on $A \cup B$
(e) If $f_n \to f$ pointwise on A and f_n is increasing then f is increasing.

Exercise 2:
Let $f_n(x) = \dfrac{\sin(nx)}{1+n^3x}$. Show that $F(x) = \displaystyle\sum_{n\in\mathbb{N}} f_n(x)$ is a convergent serie for any $x \in \mathbb{R}$. Using the inequality $|sin(x)| \leq |x|$, show that the convergence is uniform. Show that F is differentiable on $(0, \infty)$.

Homework for week 11/09-11/20:
Due Monday 11/23
11/09: Chapter 6.6: exercises 9,10 and 11 (first edition) or 2 (second edition)
and supplementary exercise:
Express the following functions as power series. Precise on which interval there is convergence.
(a) $x \cos x$
(b) $\dfrac{x}{(1+4x^2)^2}$
(c) $\log(1+x^2)$
11/13: Chapter 7.2: exercises 2 and 4 (first edition) or 2 and 3 (second edition)
11/16: Chapter 7.2: exercises 5 and 6 (first edition) or 5 and 7 (second edition)
Chapter 7.3: exercises 1 and 6 (first edition) or 1 and 9 (second edition)
11/18: Chapter 7.4: exercises 4abc, 6a and 7 (first edition) or exercises 3, 7a and 9

Homework for week 11/23-11/25:
Due Monday 11/30
Chapter 7.3: exercise 5 and Chapter 7.5: exercises 2-4-7-10 (1st edition)
or Chapter 7.3: exercise 3 and Chapter 7.5: exercises 1-8abc-9-11 (2nd edition)

4th Quizz on Wednesday 12/02
Covers: Power series, integration up to the fundamental theorem of calculus
(Chapter 6.5, 6.6 and Chapter 7.1 to 7.5)

Final exam on Wednesday 12/16

List of exercises you can revise to prepare for the final:
Chap 2.4: ex 5, Chap 2.5: ex 3 (or ex 1 in second edition), Chap 2.6: ex 1, Chap 2.7: ex 9
Chap 3.3: ex 1
Chap 4.2: ex 6 (or ex 7 in second edition), Chap 4.3: ex 9 (or ex 11 in second edition), Chap 4.5: ex 7
Chap 5.3: ex 1
Chap 6.2: ex 1, Chap 6.3: ex 3, Chap 6.4: ex 5 (or 7 in second edition), Chap 6.5: ex 1, Chap 7.3: ex 1
Chap 7.4: ex 1, Chap 7.5: ex 4-8 (or ex 8-9 in second edition).