**Math 4606(Advanced Calculus) Lecture 010 Spring 2001.**
**Last Updated: 05/03/01**

Instructor: Professor Peter A. Rejto.
Lecture: **11:15 a.m – 12:10 a.m., MWF Mech.Eng 102**
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**Textbook:** Buck, Advanced Calculus, McGraw Hill, Third Edition.

**Homework:** Homework will be assigned in class and collected a week after the assignment.

**Tests:** We will have a test on Friday February, 16, on Friday March 16, and on Friday, April 13.

**Makeup Test:** As per Senate and Math. Department policies, written documentation etc, required. For those who qualify, there will be a uniform makeup test. Time: Tuesday, April 24, 10:10 am – 11:00 am. Place: EE/Csci 2260. **On Monday, April 23, please sign up for the makeup test with Professor Rejto by giving him your name and student number on a sheet of paper.**

**Incompletes:** As per senate and Math. Department policies, written documentation etc, required. Note that arrangements have to be made before the Final!

**Record keeping:** If there is a discrepancy between your records and ours, please let us know it immediately, but not later than two weeks. In any case we shall not adjust our records after two weeks.

**Drop Date:** If you drop this course before the end of the second week, no mention of this course will appear on your transcripts.

**Grading:**

| | |
|---|---|
| Homework/Project | 30% |
| Tests 1 – 2 – 3 | 30% |
| Final Examination | 40% |

**COMPREHENSIVE FINAL EXAMINATION,**
**THURSDAY MAY 10, 4:00 pm – 6:00 pm, Mech. Eng. 102**

## Math 4606(Advanced Calculus) Spring 2001

APPROXIMATE SCHEDULE AND SUGGESTED HOMEWORK

| Week | Chapter |
|---|---|
| 1 | 1 |
| 2 | 1 |
| 3 | 2 |
| 4 | 2 |
| 5 | 3 |
| 6 | 3 |
| 7 | 4 |
| 8 | 5 |
| 9 | 6 |
| 10 | 6 |
| 11 | 7 |
| 12 | 7 |
| 13 | 7 |
| 14 | Review |
| 15 | Review |

**List of Homework as of update on p. 1**

Sec1.3;7
Sec1.2; 6, 7
Prove Theorem 7 in Chapter 1
Sec1.2;10,11,13,22,23
Sec1.3;4,5,6,17
Additional Problem 1.
Challange Problem 1.
Additional Problem 2.
Prove Theore 1, Chapter 2.
Sec 2.2, 1, 3, 5, 7, 9.
Additional Problems 3 and 4.
Sec 2.2, 12, 13.
Sec 3.2, 1,3,9.
Sec 3.2, 10.
Additional Problem 8.
Additional Problem 9.
Additional Problem 10.

Formulation of the Additional Problems.

Additional Problem 1. Let $a_1$, $a_2$ and $a_3$ be three non xero vectors in $R^2$. Prove that they are linearly dependent.

Additional Problem 2. Let $L$ be a given positive number and define the sequence of intervals $I_n$: $I_0 = [-L, L]$ and $I_1 = [-\frac{L}{2}, 0]$ or $I_2 = [0, \frac{L}{2}]$. In general,

$$\text{if } I_n = [a_n, b_n] \text{ then } I_{n+1} = [a_n, \frac{a_n + b_n}{2}] \text{ or } [\frac{a_n + b_n}{2}, b_n].$$

Next for a given interval $I$, let $|I|$ denote the length of $I$. Prove that, for each $n$,

$$|I_n| \leq \frac{1}{2^n}(2L).$$

Additional Problem 3. As usual let $C(R^n, R^m)$ denote the class of continuous functions mapping $R^n$ into $R^m$. Give three linearly independent functions in $C(R^n, R^m)$.

Additional Problem 4. Show that the functions, $1, x, x^2$ are continuous.

Additional Problem 5. Let the function $f$ mapping $R^2$ into $R^1$ be defined by $f(x) = x^2$ and for a given $R$ let the closed disk $D(0, R)$ be defined by,

$$D(0, R) = \{(x, y) : x^2 + y^2 \leq R^2\}.$$

Prove that for each $R$ the function $f$ is uniformly continuous on the closed disk $D(0, R)$.

Additional Problem 6. Extend the function $g$ of Problem 2.2.9 by defining it to bw 1 at each point where the original functio $g$ is not defined. Prove that this extended function, $g_e$, is not continuos.

Additional Problem 7. Let $g_e$ be any extension of the function $g$ of Problem 2.2.9. Prove that this extended function, $g_e$, is not continuos.

Additional Problem 8. Show that Problems 2.2.12 and 2.2.13 imply Theorem 2.13.

Additional Problem 9. Let $p$ be a polynomial of degree 3 and let $p'(0) = 0$ and $p''(0) > 0$. Prove that $p(x)$ has a local minimumat $x = 0$. In other words, prove that there is an interval, $(-\delta, \delta)$ such that

$$\min_{x \in (-\delta, \delta)} p(x) = p(0).$$

Additional Problem 10. Prove Taylor's Theorem, that is to say prove Theorem 3.15 of the text. Note that there is typo in the text.

Challange Problem 1. For a given function $f$, mapping $D(f) \in R^1$ into $R^1$, define its upper coordinate set $U_f$ by

$$U_f = \{(x, y) : x \in D(f), y \geq f(x)\}.$$

Prove that $f'' > 0$ implies that the set $U_f$ is convex.