MATH 1500 Introduction to Calculus
Course Outline
January - April 2016

LECTURES

A01:	MWF 10:30 am - 11:20 am 118 St. John's College	**A04:**	TR 11:30 am - 12:45 pm 204 Armes
Instructor:	***A. Clay***	**Instructor:**	***M. Virgilio***
A02:	MWF 9:30 am - 10:20 am 201 Armes	**A05:**	TR 1:00 pm - 2:15 pm 201 Armes
Instructor:	***R. Borgersen***	**Instructor:**	***R. Borgersen***
A03:	TR 8:30 am - 9:45 am 208 Armes	**A06:**	MWF 3:30 pm - 4:20 pm 204 Armes
Instructor:	***A. Barria***	**Instructor:**	***S. Kalajdzievski***

WEBSITE: The general website for the course is `http://www.math.umanitoba.ca/courses/MATH1500` This website is common to all sections and contains general information all sections should be aware of. However, **please check with your instructor to see if they will be running a website designed specifically for your section.**

CALCULATORS: Calculators **cannot** be used during tests or exams.

IMPORTANT DATES	**Last day to register:**	January 19
	Last day for voluntary withdrawal:	March 18
	No classes:	Feb 15-19 (Mid-Term break), Mar 25 (Good Friday)

GRADE COMPONENTS:	**FINAL EXAMINATION**	**60%**
	MIDTERM EXAMINATION	**30%**
	QUIZZES	**10%**

MIDTERM EXAMINATION: The midterm exam will be held on **February 23, 2016 from 5:30 p.m - 6:30 p.m.** Its location will be announced closer to the date. Students who miss writing the midterm exam for valid medical or compassionate reasons may be granted permission to write a deferred exam by their instructor.

FINAL EXAMINATION: The date, time, and location of a **2-hour-long** final examination will be set and published by the Registrar's Office. Students are reminded that they must remain available until all examination and test obligations have been fulfilled. The exam period is April 11 - 25, 2016.

TUTORIALS: Each lecture section is divided into a number of tutorial sections - a smaller number of student where you get a chance to see more examples worked out and to work on problems under the supervision of a teaching assistant who knows the subject. As with the lectures, you can greatly increase the effectiveness of the tutorials by preparing for them: If you are aware of specific difficulties before you go into the tutorial, you are more likely to get them solved. There will be five quizzes given in the tutorials, approximately one every two weeks. The quiz grade will be calculated using the best 4 out of 5 quizzes. Make-up tests for missed tests are **not available**. Students who miss a test due to valid medical or compassionate reasons should contact their instructor.

Tutorials begin on Thursday, January 14, 2016.

Living with Mathematics: January 2016.

Learning mathematics is a lot like building a house. A strong foundation is needed to produce a sturdy structure, while a weak foundation will quickly expose any structural deficiencies. In much the same way, you will require a good grounding in high school mathematics if your study of MATH 1500 is to be successful.

YOU CANNOT LEARN MATHEMATICS BY CRAMMING AT THE END OF TERM. It is just not that kind of subject; it involves ideas and computational methods which cannot be learned without practice. By way of an analogy, how many athletes do you know who do well in contests by training for only a few days in advance?

These notes attempt to provide some hints about how to get the most out of the teaching system used for this course (**lectures and tutorials**), and also to provide some concrete information of a more or less useful nature (**Help Centre, marks**). Before you consider particular items, there are a couple of **regulations** about lectures and tutorials that you should be aware of:

1. You must **take and also attend** one of the tutorials **associated with the lecture section in which you are registered**. Consult the Registration Guide for the times of these tutorials.
2. There are marks associated with your tutorial work (as explained earlier). You must write the quiz in the tutorial section in which you are registered.

LECTURES: During lecture periods, professors present the course material to you. Because of the relatively large numbers of students in a lecture section and the necessity of presenting a certain amount of new material each day, lectures may seem rather formal. Almost certainly they will be quite different from your previous classroom experience.

No teaching system can be effective without work: Do not expect to learn mathematics simply by listening to lectures (or even taking notes). Here are a couple of ways to increase the effectiveness of the lecture system:

1. **Review** the lecture material as soon as possible, preferably the same day. Use the text during this review, and understand the material as completely as you can. Do as many textbook problems as you can; mathematics is a problem solving discipline. You cannot learn by watching other people solve problems - you have to solve them yourself. (See comments on tutorials as well).
2. **Refer to the course outline**, and try to read through the material before it is covered in lectures. In such a process, it is not necessary to completely understand; if you have even a vague notion about what is going on from reading ahead, the lectures will be easier to follow.

QUESTIONS: Do not be troubled if you have questions, because everyone does. Some have less, some have more, but in any case you can bet that if you have a question, someone else probably has the same one. Thus, while it may require taking a deep breath to ask a question in class, you will likely do a service to your classmates.

Because of the relatively large number of students involved and the necessity of presenting course material, general discussion in lecture periods has to be somewhat controlled. There is a little more time available for questions in tutorials, but even with this you may find that you cannot get all your difficulties settled in the scheduled teaching periods. So here are some ways to get answers to questions.

1. **Study your textbook**. (This may seem pretty obvious, but people do not always think of it.)
2. **Go to your professor** or possibly your tutorial instructor during their office hours, or if that is not possible, arrange another time you can meet with them. You will find them quite willing to help.
3. **Talk** the problem out with other students. In this sort of exchange, both parties usually benefit. So, if someone asks you a question, do not brush them off because it might waste your time. If you can solve their problem, you may well learn in the process.

4. **Form** study groups by identifying 3-5 classmates with whom you can study weekly.

5. **Go to the Mathematics Help Centre** by yourself or collectively, with your study group. This is located in Room 412 Machray Hall. Its purpose is to provide a place where students can get answers to specific mathematical problems related to their course. The hours of operation will be posted on the door.

ONE CAUTION: DO NOT EXPECT ANYONE TO RE-TEACH LARGE CHUNKS OF THE COURSE. It is **your responsibility** to keep up with course material.

Statement on Academic Dishonesty

The Department of Mathematics, the Faculty of Science and the University of Manitoba all regard acts of academic dishonesty in quizzes, tests, examinations or assignments as serious offences and may assess a variety of penalties depending on the nature of the offence.

Acts of academic dishonesty include bringing unauthorized materials into a test or exam, copying from another student, plagiarism and examination personation. Students are advised to read section 7 (Academic Integrity) and section 4.2.8 (Examinations: Personations) in the General Academic Regulations and Requirements of the current Undergraduate Calendar. Note, in particular, that cell phones and pagers are explicitly listed as unauthorized materials, and hence may not be present during tests or examinations.

Penalties for violation include being assigned a grade of zero on a test or assignment, being assigned a grade of "F" in a course, compulsory withdrawal from a course or program, suspension from a course/program/faculty or even expulsion from the University. For specific details about the nature of penalties that may be assessed upon conviction of an act of academic dishonesty, students are referred to University Policy 1202 (Student Discipline Bylaw) and to the Department of Mathematics policy concerning minimum penalties for acts of academic dishonesty.

All students are advised to familiarize themselves with the Student Discipline Bylaw, which is printed in its entirety in the Student Guide, and is also available on-line or through the Office of the University Secretary. Minimum penalties assessed by the Department of Mathematics for acts of academic dishonesty are available on the Department of Mathematics web-page.

TEXT: James Stewart, *Single Variable Calculus - Chapters 1 through 5* "Second Custom Edition" (black cover, coil bound, custom made for the UofM), with Student Solutions Manual (Package ISBN: 9780176575076), 7th ed., Brooks/Cole, **OR** (if you are just planning to take MATH 1500)

James Stewart, *Calculus: Early Transcendentals*, full version, 7th edition, Brooks/Cole with Student Solutions Manuals (Package ISBN: 9781285989938) (if you will also be continuing to MATH 1700 and/or MATH 2720 and/or MATH 2730)

Course Outline and Suggested Homework Exercises

Section	Title	Page Numbers	Suggested Homework (Odd Numbers)
1.1	Four Ways to Represent a function	9 – 22	1-15, 22-64, 69-70
1.3	New Functions from Old Functions	36 – 44	1-4, 28-46, 57
1.5	Exponential Functions	51 – 58	1-6, 11-16, 19-20
2.2	Limit of a Function	86 – 98	1-12, 15-18, 29-37
2.3	Limit Laws	99 – 108	1-32, 37-46, 49
2.5	Continuity	118 – 130	1-8, 12-31, 41-43, 51-54
2.6	Limits at Infinity: Horizontal Asymptotes	130 – 143	1-10, 15-38, 41-46, 52-56, 60
2.7	Derivatives & Rates of Change	143 – 153	5-8, 12-15, 17, 33-40
2.8	The Derivative as a Function	154 – 165	1-11, 16-18, 21-31, 43-46
3.1	Derivatives of Polynomials & Exponential Functions	174 – 183	1-36, 47, 51-55, 60-63
3.2	Product & Quotient Rules	184 – 191	1-34, 41-48
3.3	Derivatives of Trigonometric Functions	191 – 198	1-24, 31-34, 39-50
3.4	The Chain Rule	198 – 208	1-54, 61-64, 77-79
3.5	Implicit Differentiation (omit inverse trig. functions)	209 – 217	1-32
3.9	Related Rates	244 – 250	1-31

MIDTERM EXAM (1 hour) = 30% on February 23, 2016 at 5:30 p.m.

1.6	Inverse & Logarithmic Functions	58 – 71	1-18, 35-41, 49-58
3.6	Derivatives of Logarithmic Functions	218 – 223	1-34, 39-54
4.1	Max & Min Values	274 – 282	1-44, 47-61
4.2	Mean Value Theorem	284 – 289	9-12, 19-21
4.3	How Derivatives Affect the Shape of a Graph	290 – 301	1-29, 31-51
4.5	Curve Sketching (omit oblique asymptotes)	310 – 318	1-40, 42-53
4.7	Optimization Problems	325 – 337	1-21, 23-40
4.9	Antiderivatives	344 – 350	1-17, 20-22, 25-43, 45-52, 59-65
5.1	Areas and Distances	360 – 371	1-5
5.2	Definite Integral	371 – 385	1-3, 33-40, 51
5.3	Fundamental Theorem of Calculus	386 – 397	1-48, 55-63
5.4	Indefinite Integrals	397 – 404	1-35, 49-50

FINAL EXAM (2 hours) = 60% (Location and date TBA)

Theorems whose proofs you must know:

2.8	*differentiable* $\Longrightarrow$ *continuous*	3.3	$(\sin x)' = \cos x$
3.1	$(cf)' = cf'$	4.2	$f' = 0$ *on* $I \Longrightarrow f$ *is constant on* I
3.1	$(f+g)' = f' + g'$	4.3	$f' > 0$ *on* $I \Longrightarrow f$ *is increasing on* I
3.2	$(fg)' = f'g + fg'$	4.3	$f' < 0$ *on* $I \Longrightarrow f$ *is decreasing on* I