Course Syllabus

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COURSE: MATH 200 CALCULUS III (Still under construction)

CREDITS: 3

TERM: 2022 WT1

PREREQUISITES: MATH 101

GENERAL POLICIES AND SYLLABUS INFORMATION (https://www.math.ubc.ca/general-syllabus-information)

ABSENSE FROM CLASS AND MISSED ASSESSMENTS: If you are unable to attend lectures in person for whatever reason (visa issues, absence due to illness, emergency travel), you will be expected to follow the course by reading lecture notes and announcements posted to your section module/page. In particular, no exemptions or special allowances will be made for online homework (Webwork) which you will be expected to submit on time. You must inform your instructor in the case of a MISSED IN CLASS TEST, and follow the procedure in the General Policy link above for academic concessions. If you are granted an exemption from a test by your instructor, then your grade for the test will appear as ``E" in the Canvas gradebook, and a ``scaled version" of your final exam grade will later be used to replace your missing grade for that test, and the scaling will be done in a way which is fair to everyone. If you miss all three in class tests for whatever reason, you will be asked to de-register from the course.

Welcome to MATH 200! This is the common canvas site for all nine sections of MATH 200 in Term 1 of the 2022W session (September to December 2022). Section specific information and materials can be found in the **INDIVIDUAL SECTION MODULES** within this site, be sure to check these regularly for updates. Your grade in the course will be determined by your grades in

- weekly webwork assignments (worth 10% of overall grade) see below for schedule/dates.
- 3 in class Tests (worth 30% of overall grade) see below for schedule/dates.
- 1 final exam (worth 60% of overall grade)

All the basic information on these can be found below. The tests will be held during regular class time. It is your own responsibility to also check your own sections module (within this site) for any section specific instructions regarding these and for other announcements in general. In particular, different

sections will have different tests and your grades in these assessments may be scaled to ensure fairness across the different sections of the course. The final exam however will be the same for all sections.

INDIVIDUAL SECTION (TIMES & LOCATIONS)

- **SECTION 101 (Instructor: Kim, Young-Heon)** (MWF 9:00am-10:00am, CHEM B250)
- **SECTION 102 (Instructor: Hermon, Jonathan) (MWF 11:00am-12:00pm, LSK 200)**
- **SECTION 104 (Instructor: Colliander, Jim) (MWF 1:00pm-2:00pm, LASR 104)**
- **SECTION 105: (Instructor: Albert Chau (TT 9:30am-11:00am, BUCH A103)**
- **SECTION 107 (Instructor: Bruce, Benjamin) (TT 3:30pm-5:00pm, BUCH A103)**
- **SECTION 109 (Instructor: Chau, Albert (TT 11:00am-12:30pm, SWNG 222)**

Go to individual section modules (click on ``Modules" in left tool bar) for instructor contact information and other section specific information.

TEXTBOOKS AND REFERENCES

There is no required textbook for the course. Most standard hardcopy books on multivariable Calculus, and also some free online books would serve our purposes in this course. You are free to use any these as you like. JUST PAY ATTENTION THAT EMPHASES AND ORDER OF TOPICS IN OUR LECTURES MAY DIFFER FROM ANY GIVEN TEXTBOOK. The following online books (first two in particular) are in fact all you need for the course and references in the course will be limited to these.

- **UBC Calculus Textbook series (http://www.math.ubc.ca/~CLP/index.html) (http://www.apexcalculus.com/)** (See CLP 3 of this series. Reference to sections and also suggested exercises appear below)
- **reference #1 (http://www.apexcalculus.com/)** (Reference to sections and also suggested exercises appear below).
- **reference #2 (https://www.whitman.edu/mathematics/multivariable/multivariable.pdf)**
- **reference #3 (https://open.umn.edu/opentextbooks/BookDetail.aspx?bookId=10)**

Our reference and use of these free online textbooks will be in accordance with the **creative commons lisence (http://creativecommons.org/licenses/by-nc-sa/3.0/)** .

WEBWORK ONLINE HOMEWORK

- Access your weekly webwork assignments through the ``Assignments'' table on left. All information on these assignments including due dates is indicated within the webwork site. Note that the intent of homework is to help you learn the material, and therefore it should be done as you are studying.
- WEBWORK ASSIGNMENTS WILL APPEAR SOON AFTER CLASSES BEGIN

IN CLASS TESTS (see your own section page for more details)

There will be 3 in class Tests. To take place in class on the dates listed below. The length of the test may vary slightly from section to section. All test information (topics, duration, format, solutions) is specific to each section and will be listed in your own section module closer to the test dates. The Friday dates below are for MWF sections, and the Thursdays are for TT sections. The test topics below should serve only as a general guide, and you must look to your own section module closer to test date for specific test topics/information. Thus, different sections will write different tests while all sections write a common final exam. As a result, a given sections test grades will be scaled (in relation to that sections final exam grades) to ensure fairness across the sections.

- **Test 1 (Functions and 3-D geometry)**: (Wed Sep 28 and Thu Sep 29)
- **Test 2 (Differentiation)** : (Thu Oct 27 and Fri Oct 28)
- **Test 3 (Integration)**: (Tue Nov 29 and Wed Nov 30)

COURSE OUTLINE

The following is an outline of the topics to be covered in the course. The suggested problems from the references listed below roughly represent the order in which we will be covering the topics. These will not be collected or graded. The topic outline, and suggested problems, can be viewed also as LEARNING GOALS for the course. You are strongly advised to work out the problems in detail before looking at the solutions as they will give you practice in the techniques learned in class and provide essential help in preparing for the WebWorK homework, midterms, and final exam. Suggested problems

from **PAST FINALS (https://www.math.ubc.ca/Ugrad/pastExams/)** (http://www.wolframalpha.com/) are also listed below for past exam problems based on their topics. You can find solutions to many past finals at the link **SOLUTIONS TO PAST FINALS (http://www.math.ubc.ca/~feldman/m200/M200oldExams.html)** (http://www.wolframalpha.com/) Finally, you are encouraged to learn how to use **Wolfram Alpha** (http://www.wolframalpha.com/) (the syntax you need to know for this is similar to using Webwork, which you will have to use anyways) although there will not be specific reference to it in the course. You can even check some of your homework answers with Wolfram Alpha.

PART I: MULTIVARIABLE FUNCTIONS AND 3-DIMENSIONAL GEOMETRY (Chapter 1 (CLPIII)); (10.1-10.6 (reference #1))

Coordinate systems, basics of multivariable functions, equations and surfaces, vectors. Think of this section as pre-multivariable Calculus.

TOPICS:

-three dimensional coordinate systems

-functions of 2 or 3 variables, graphs and level surfaces

-vectors; arithmetic, dot product, cross product

-lines and planes

suggested problems from CLP3:

See **CLP-3 Multivariable Calculus problem book(** (http://www.math.ubc.ca/~CLP/CLP3/problem_book_clp3.pdf)) (Chapter 1). There you will also find solutions to some past final exam problems.

suggested problems from reference #1:

Section 10.1, problems 1-3, 7, 9, 12, 16, 15, 17, 27, 32

Section 10.2, problems 1-5, 8, 11, 15, 20, 23, 27, 31

Section 10.3, problems 1-3, 11, 15, 19, 31, 39

Section 10.4, problems 1-5, 9, 15, 27, 30, 31, 35, 39, 41

Section 10.5, problems 7, 11, 21, 27, 31

Section 10.6, problems 1, 2, 9, 11, 14, 15, 17, 19, 25, 29, 32

suggested problems from past final exams (mostly involving lines and planes in space):

2015WT1 #1a, b

2013WT2 #1a, b, c

2013WT1 #1a (i, ii)

2012WT1 #1

2011WT2 #1

PART II: DIFFERENTIATION OF MULTIVARIABLE FUNCTIONS (Chapter 2 (CLPIII)); (12.1-12.8 (reference #1) & 14.8 (reference #2))

The differentiability of a two variable function $f(x, y)$ at a fixed point $(x, y) = (a, b)$ is symbolically expressed by the equation

$$df = Adx + Bdy$$

asserting that: for some fixed numbers A and B, any infinitessimal (tiny) changes dx, dy in the variables produce a corresponding change df in the function satisfying the symbolic equation. A very similar equation is used in the case of a function of 3 or more variables. We will learn the precise meaning of the above symbolic equation, how to use it, and how it encodes almost all the important formulas from multivariable Calculus.

TOPICS:

-Definition of differentiability for multivariable functions.

-limits.

-Partial derivatives

-Tangent planes and linear approximations

-chain rule

-directional derivatives and gradient vector

-Maximum and minimum values, Lagrange multipliers

suggested problems from CLP3:

See **CLP-3 Multivariable Calculus problem book((http://www.math.ubc.ca/~CLP/CLP3/problem_book_clp3.pdf)** (Chapter 2). There you will also find solutions to some past final exam problems.

suggested problems from reference #1:

Section 12.1, problems 1-6, 7, 11, 17, 19, 21, 23, 26, 27, 29, 31

Section 12.2, problems 17, 18, 19 Section 12.3, problems 1-4, 5, 13, 19, 29, 33

Section 12.4, problems 7, 10, (find equation of tangent plane to z=f(x, y) at given point for 11, 12) , 13, 15, (find linear approximation for 17, 18 at the given point)Section 12.5, problems 1-5, 9, 17, 21, 29

Section 12.6, problems 1-6, 13, 15, 21, 23, 25, 27

Section 12.7, problems 17, 19, 21, 23

Section 12.8, problems 1-4, 5, 7, 11, 13, 15, 17 (also 11, 13, 15, 19 from 14.7 in reference #2)

Section 14.8 (from reference #2) 5, 10, 11, 12, 13, 15, 17

suggested problems from past final exams (mostly involves linear approximation, tangent plane to graphs):

2016 #3 a)

2015 #2 ii

2011WT2 #2a

2011WT2 #2b

2011WT1 #1b, c

suggested problems from past final exams (mostly involves chain rule and/or implicit diff.):

2016 #4 a)

2015 #3

2014 #2, #3

2013WT2 #2a

2013WT1 #1b(ii, iii)

2013WT1 #1c

2013WT1 #1d

2012WT1 #2, 3

2011WT2 #3

2011WT1 #2

suggested problem from past final exams (involves gradient vectors and relations to directional derivatives, and level sets):

2016 2(i,iv); 3(b,c); 2015 #1(iii)

2015 #2(i, iii)

2014 #1, 4

2013WT1 #1b(i)

2013WT2 #2 b, c

2013WT1 #1e

2013WT1 #1f

2013WT1 #2

2011WT2 #4

2011WT1 #3

suggested problems from past final exams (involves classifying local extrema, absolute extrema, Lagrange Multipliers):

2015 #4, 5

2014 #5

2013WT2 #3, 4

2013WT1 #3, 4

2012WT1 #4, 6

2011WT2 #5

2011WT1 #4

PART III: INTEGRATION OF MULTIVARIABLE FUNCTIONS (Chapter 3 (CLPIII)); (13.1-13.6 (reference #1) and 14.4 (reference #3))

The double integral of a two variable function $f(x, y)$ over a region R in the plane is denoted symbolically as

$$\int\int_R f(p)\, dA$$

and represents an area-weighted continuous summation of f over R where in particular: p represents a point in R, dA the area of an infinitessimal (tiny) patch around p, and $\int\int_R$ a continuous summation over all points p in R. We will give a precise definition of double integrals, interpret them in various different contexts, and learn to calculate them explicitly. We will then similarly define and treat triple integrals of three variable functions over regions in space.

TOPICS:

-double integrals over rectangles

-double integrals over general regions

-double integrals in polar coordinates

-applications of double integrals

-triple integral

-Triple integrals in cylindrical and spherical coordinates

suggested problems from CLP3:

See **CLP-3 Multivariable Calculus problem book (http://www.math.ubc.ca/~CLP/CLP3/problem_book_clp3.pdf)** (Chapter 3). There you will also find solutions to some past final exam problems.

suggested problems from reference #1:

13.1 PROBLEMS: 7, 9, 19, 21 (also see #3, 5, 10, 13, 15 from section 15.1 reference #2)

13.2 PROBLEMS: 1-4, 7, 9, 13, 17, 21, 25 (also see #17, 21, 23 from section 15.1 reference #2)

13.3 PROBLEMS: 3, 4, 8, 13, 15

13.4 PROBLEMS: 1, 5, 6, 13, 24

13.6 PROBLEMS: 5, 7, 9, 11, 13, 15, 19, 23

14.4 (from reference #3) PROBLEMS: 11, 13, 15, 19, 22, 23

suggested problems from past final exams (double integrals):

2015 #6

2014 #6

2013WT2 #5, 6a

2013WT1 #5, #6

2012WT1 #7,8

2011WT2 #6, 7

2011WT1 #5, 6

suggested problems from past final exams (triple integrals in rectangular, cylindrical and spherical coord):

2015 #7, 8

2014 #8, 9

2013WT2 #7,8

2013WT1 #7, 8, 9

2012WT1 #9,10

2011WT2 #8, 9, 10

2011WT1 #7, 8

ADDITIONAL RESOURCES AND INFORMATION (MATH AND NON-MATH RELATED)

- **Math 200 resource wiki.** **(http://wiki.ubc.ca/Science:Math_Exam_Resources/Courses/MATH200)**
- In addition to your instructor's office hours, please take advantage of the **Math Learning Centre drop-in tutoring.** **(http://www.math.ubc.ca/Ugrad/ugradTutorials.shtml)** Do not wait till the exams -- if you feel uncomfortable with any of the material, talk to your classmates, talk to the instructor, and come ask questions at the Math Learning Centre.

- You can use **Wolfram Alpha (http://www.wolframalpha.com/)** -- it is a wonderful tool for calculations, plotting graphs of functions of two variables, and various other tasks. If you want to visualize, for example, the surface x^2+xy-y^2+3z=0, just type in "plot (x^2+xy-y^2+3z=0)".
- UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Course Summary:

Date	Details	Due
	Webwork (https://canvas.ubc.ca/courses/103676/assignments/1320687)	