MATH 2004B (Multivariable calculus for engineering or physics)
Winter 2022

Instructor: Dr. Minyi Huang Office: 5269 HP
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Text: *The ABC's of Calculus*, Volume 2 by Angelo Mingarelli

Lecture: The lectures will be delivered online as a combination of
(i) posted short videos,
(ii) synchronous lecturing through ZOOM.
For (ii), the scheduled meeting time is Wed and Fri, 8:35 am – 9:55 am.
Announcements regarding (ii) will be made on Brightspace in advance.
For admission to ZOOM, you are required to indicate your name
by Given name + Family name.

Tutorial: Online, Fri 5:35 pm – 6:25 pm starting on **Jan 21**

Office Hours: Wed 1 pm – 2 pm

Prerequisite: i) MATH 1005 or MATH 2007; and
ii) MATH 1104 or MATH 1107; or permission of the School
Precludes additional credit for BIT 2005, MATH 2000, and MATH 2008

Tests: Fridays, Feb 4; Mar 4; and Apr 1.

Note: There will be 3 tests during the tutorials of the designated dates. If you achieve at least 20% for each of the three tests, the best two will be counted. No make-up, early, or delayed tests will be held. Absence is excused only for medical reasons (a doctor's note may be presented), or situations in accordance with Carleton's accommodation policies. Any missing test will be counted as zero. Due to the pandemic situation, we understand it may be difficult to obtain a doctor's note. If you miss a midterm test due to illness, you may elect to submit within 3 business days the self-declaration form https://carleton.ca/registrar/wp-content/uploads/COVID-19_Self-declaration.pdf. This excuse may be used only once for tests.

Important Dates:		
	First lecture	Jan 12
	Last day to change courses	Jan 24
	Last day to withdraw	Jan 31
	Winter break	Feb 22-25
	Last lecture	Apr 8
	Exam period	Apr 14 – 28

Grading Scheme:		
	Assignments	30%
	Tests	30%
	Final Exam	40%

Time used in this outline: All dates and time in this outline mean the Ottawa local time; see https://www.timeanddate.com/worldclock/canada/ottawa.

Email communication with instructor: Please use your Carleton account ONLY for all course related email, and write on the **subject line** your course code MATH2004, which I will use to manage email.

Textbook: You can buy access to this book for 120 days via this link: https: //mingarelli.com/books/the-abcs-of-calculus-multi-variable/. There is also a free solutions manual for this book, available under https://people.math.carleton.ca/ angelo/calculus/ABC2-Solutions-Apr22-2021-Pandemic.pdf.

Announcements: You are responsible for keeping up with information announced on Brightspace, or sent to your e-mail account.

Assignments: They will be given regularly. You will be given sufficient time to work out. You are advised to start your work as early as possible. Never delay your work until very close to the deadline.

Final examination (40%): This is a three (3) hour open-book exam scheduled by the University during the final exam period from April 14–28, 2022. By open-book, it means you may consult the course materials. Collaboration with another person on the solution is prohibited. **When the exam is completed, you are given 20 minutes to upload your solution**. It is the responsibility of each student to be available at the time of the examination.

Solution submission for assignments, tests, and final exam: For each assignment or test (if requested to submit long answer solutions), or the final, you are required to submit the solution as **a single PDF file**. No other format is accepted for grading. If your solution is scanned, make sure you convert it into the PDF format. Never wait until the last minute to submit. In particular, when it seems you do not have enough time to complete your test or final solution, you must reserve time to scan and submit first. After your submission, make sure to immediately download from Brightspace to verify that your submitted PDF file is readable. No late submission or resubmission will be granted. A late submission actually submitted will **not** be counted.

Conditions to pass the course: You are required to achieve at least 30% of your overall term work (including assignments and term tests) and 30% of the final examination to pass the course. Although the absence from some tests for medical reasons may be excused, this course requires the student's adequate workload and participation.

Calculators: You may use only simple non-programmable, non-graphing calculators for the tests and the final examination in this course.

Intellectual property notice: All materials created for this course (including lecture notes, posted/recorded videos, assignments and tests and posted solutions, the final exam, etc) remain the intellectual property of the instructor. These materials are intended for the personal and non-transferable use of students registered in the current offering of the course. Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without written consent from the instructor. A student who publicly posts or sells an instructor's work, without the instructor's expressed consent, may be charged with misconduct under Carleton's Academic Integrity Policy and/or Code of Conduct.

Academic Accommodation: You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. Please make sure you respect these timelines particularly for in-class tests, mid-terms and final exams.

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://carleton.ca/equity/accommodation.

Students with disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to

ensure accommodation arrangements are made. The deadline for submitting completed forms to the Paul Menton Centre for **December** Examinations is **Mar. 16, 2022**.

Academic Integrity: Any student violating the University's standards of academic integrity, including but not limited to misconduct in their coursework, tests, and final examination, will be subject to appropriate sanctions. For more details, visit the Registrar's Office website
https://carleton.ca/registrar/academic-integrity/.

Course schedule

- Week 1

  Vectors in the Plane and Space (textbook sections 1.1-1.10; homework problem sets 1-4)

  Rotations of Axes and Translations in the Plane (textbook sections 2.1-2.6; homework problem sets 5-9).

- Week 2

  Planar Curves and Conic Sections (textbook sections 2.7 and 2.8; homework problem sets 10-16).

  Applications to Area and the Length of Curves (textbook sections 2.9-2.10; homework problem sets 17 and 18).

- Week 3

  Polar Coordinates and Applications (textbook sections 2.11-2.14; homework problem sets 19-22).

  Limits, Continuity, and Partial Derivatives (textbook sections 3.1-3.3; homework problem sets 23-25).

- Week 4

  Multivariate Differentiability, Directional Derivatives and Gradients (textbook sections 3.4-3.5; homework problem sets 26-28).

  The Chain Rule, Implicit Differentiation, Tangent Planes and Normal Lines (textbook section 3.6; homework problem sets 29 and 30).

- Week 5

  Conservative Fields, Divergence and Curl (textbook section 3.7; homework problem set 31).

  Line Integrals (textbook sections 4.1-4.3; homework problem sets 32-34).

- Week 6

  Double Integrals and Iterated Integrals (textbook sections 5.1 and 5.2; homework problem sets 35-38).

  Applications to the Volume under a Surface (textbook section 5.3; homework problem set 39).

- Week 7

  Change of Variables in Double Integrals (textbook section 5.4; homework problem set 40).

  Three-dimensional Plots (textbook section 5.5; homework problem set 41).

- Week 8

  Parametric Equations of Surfaces (textbook section 5.6; homework problem set 42).

  Surface Integrals and Some Applications (textbook sections 6.1 and 6.2; homework problem set 43).

- Week 9

  Green's Theorem (textbook section 6.3; homework problem set 44).

  Stokes' Theorem (textbook section 6.4; homework problem set 45).

- Week 10

  Triple Integrals (textbook sections 6.5 and 6.6; homework problem set 46).

  Describing Solids in Cylindrical and Spherical Coordinates (textbook section 6.7; homework problem set 47).

- Week 11

  The Divergence Theorem (textbook section 6.8; homework problem set 48).

  Taylor Polynomials, Maxima and Minima, Lagrange Multipliers (textbook sections 7.1-7.3; homework problem sets 49 and 50).

- Week 12

  Volumes of Solids of Revolution, Centroids and Centers of Mass, and the Area of a Surface (textbook sections 7.4-7.6; homework problem set 51).

Note: The above is a tentative schedule and may be subject to change depending on the progress of the course.