THOMPSON RIVERS UNIVERSITY | Mathematics and Statistics

Course Outline

MATH 2110 – 02
Calculus 3 (3,1.5,0)
Fall 2019

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Office Hours: TBA or by appointment

Calendar Description

The concepts of single-variable calculus are extended to higher dimensions by using vectors as variables. Topics include the following: vector geometry and the analytic geometry of lines, planes and surfaces; calculus of curves in two or three dimensions, including arc length and curvature; calculus of scalar-valued functions of several variables, including the gradient, directional derivatives and the Chain Rule; Lagrange multipliers and optimization problems; double integrals in rectangular and polar coordinates.

Education Objectives/Outcomes

On completion of the course, the student will be expected to:

1. perform calculations with vectors and geometric shapes related to vector addition and subtraction;
2. understand equations of lines and planes, work with parallel, perpendicular and oblique lines and planes;
3. work with vector functions and interpret them as curves in spaces;
4. calculate derivatives and integrals of vector functions, solve problems involving arc length and curvature, velocity and acceleration;
5. operate on functions of several variables: calculate limits, determine continuity, compute partial derivatives;
6. find tangent planes and linear approximations for functions at a given point;
7. differentiate compound functions of several variables;
8. compute directional derivatives and gradients, and solve problems involving them;
9. determine extremal values of a function of several variables;
10. solve constrained optimization problems using Lagrange multipliers;
11. compute double integrals over rectangular and general domains, in Cartesian and polar coordinates.

Prerequisites

Prerequisite: MATH 1230 or 1240 (Calculus 2) or equivalent. Corequisite: MATH 2120 recommended if MATH 1300 not previously completed. Required Seminar: MATH 2110S.

Texts/Materials

James Stewart, *Multivariable Calculus*, 8th edition.

Student Evaluation

Weekly quizzes (×4) 15%
Midterm exams (×2) 40%
Final exam 45%

In the event a student misses an exam, a mark of zero will be given unless the student contacts the instructor prior to the exam, informing the instructor of the particular situation. Students are responsible for checking the final examination schedule which shall be posted each semester by the Registrar, and for advising the Registrar of any conflicts within the schedule. Attendance at a scheduled final examination is mandatory, and the responsibility is on the student to seek remedy for a missed final exam.

Students who require special accommodation due to a disability are encouraged to contact Accessibility Services.

Attendance Regulations

A registered student who does not attend the first two events (e.g., lectures/labs/etc.) of the course and who has not made prior arrangements acceptable to the instructor may, at the discretion of the instructor, be considered to have withdrawn from the course and have his/her course registration deleted. A registered student is expected to attend a minimum of 90% of lectures and seminars for which he/she is enrolled. In the case of deficient attendance without cause, a student may, on recommendation of the instructor to the instructors Dean or Chairperson, be withdrawn from a course. Admission to a lecture or seminar may be refused by the instructor for lateness, class misconduct, or failure to complete required work.

Academic Integrity Policy

TRU students are required to comply with the standards of academic integrity set out in Student Academic Integrity policy (ED 5-0), available at TRU website. Cheating, academic misconduct, fabrication, and plagiarism could result in failure of a course or even suspension from TRU.

Prior Learning Assessment and Recognition/Challenges

Students may receive credit for Prior Learning Assessment and Recognition (PLAR) by writing a challenge examination designed by a qualified specialist approved by the Department of Mathematics and Statistics. More information can be obtained from the Office of the Registrar.

Use of Technology

A scientific calculator is allowed. Graphing calculators are not permitted on tests or quizzes. Cell phones are to be turned off and not used during class.

Math Help Centre

All students are welcome to consult with a math tutor on a drop-in basis, free of charge, at the Math Help Centre, which is located in House of Learning Room 304. More information is available on the following webpage: `https://www.tru.ca/science/programs/math/math_help_centre.html`

Course Topics

1. **Vectors and Analytic Geometry ..... Ch. 12**
   Rectangular coordinates in three dimensions (review)
   Vectors in three dimensions (review)
   Equations of lines and planes
   Cylinders and quadric surfaces

2. **Vector Functions ..... Ch. 13**
   Vector functions and space curves
   Derivatives and integrals of vector functions
   Arc length and curvature
   Motion in space: velocity & acceleration

3. **Partial Derivatives ..... Ch. 14**
   Functions of several variables
   Partial derivatives
   Tangent planes and linear approximations
   The chain rule
   Directional derivatives and the gradient vector
   Maximum and minimum values
   Lagrange multipliers

4. **Multiple Integrals ..... Ch. 15**
   Double integrals over rectangles
   Double integrals over general regions
   Double integrals in polar coordinates