MATH13217 *Advanced Calculus*
Term 1 - 2018

Profile information current as at 11/05/2024 12:53 am

General Information

Overview

The unit covers topics in multivariable calculus - differential and integral calculus as applied to scalar and vector functions of more than one variable. After reviewing vectors and the geometry of space, we investigate derivatives and integrals of vector functions with applications to arc length, curvature of space curves and motion in space. Then partial differentiation is studied by defining limits and continuity in two dimensions, and is used to define tangent planes, linear approximations and differentials. The chain rule is developed for functions of more than one variable as well as directional derivatives and the gradient vector, which leads into multivariate optimisation with and without constraints. Multiple integrals are studied by expanding the concept of single variable integrals to double and triple integrals which are evaluated as iterated integrals. These ideas are further developed to show how to calculate volumes, surface areas, masses and centroids of very general regions in two and three dimensional space as well as probability for bivariate distributions. Finally we investigate the calculus of vector fields. We define and study vector fields, line integrals and surface integrals. The connection between these new types of integrals and multiple integrals is given in three theorems - Green's Theorem, Stokes' Theorem and the Divergence Theorem - which turn out to be higher-dimensional versions of the Fundamental Theorem of Calculus. Mathematical software is used to investigate and solve most problems in the unit. Note: If you have completed unit MATH12172 then you cannot take this unit.

Details

Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *7*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

Prerequisite MATH12224 Calculus and Linear Algebra B
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2018

- Distance

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 25%
2. **Written Assessment**
Weighting: 25%
3. **Written Assessment**
Weighting: 50%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from student feedback

Feedback

Students commented favourably upon : texkbook, the take-home exam and feedback on assignments

Recommendation

Continue to offer a positively supported resources

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Solve geometric problems in three dimensional space using vectors and their operators.
2. Calculate derivatives and integrals of vector functions to solve problems involving arc length and curvature of space curves.
3. Apply the concept of the limit, continuity and partial derivative of a function of many variables as well as calculate tangent planes, linear approximations and differentials.
4. Apply the chain rule, directional derivatives and the gradient vector to solve problems, particularly multivariable optimisation problems either with or without constraints.
5. Calculate double & triple integrals over general regions, and also in polar, cylindrical and spherical coordinates.
6. Apply the change of variables technique to simplify the evaluation of a double or triple integral.
7. Evaluate line integrals both in space and of vector fields, plus solve problems involving the curl and divergence of a vector field.
8. Calculate the surface integral of a scalar function or of a vector field, plus use Green's theorem, Stokes' Theorem and the Divergence Theorem to solve problems.
9. Use mathematical software to visualise, analyse and solve problems in multivariable calculus.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level ◦ Introductory Level • Intermediate Level • Graduate Level ◦ Professional Level ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
1 - Written Assessment - 25%	•	•	•	•					•
2 - Written Assessment - 25%					•	•			•
3 - Written Assessment - 50%	•	•	•	•	•	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
1 - Communication	•	•	•	•	•	•	•	•	•
2 - Problem Solving	•	•	•	•	•	•	•	•	•
3 - Critical Thinking	•	•	•	•	•	•	•	•	•
4 - Information Literacy	•	•	•	•	•	•	•	•	•
5 - Team Work									
6 - Information Technology Competence	•	•	•	•	•	•	•	•	•
7 - Cross Cultural Competence									
8 - Ethical practice	•	•	•	•	•	•	•	•	•
9 - Social Innovation									
10 - Aboriginal and Torres Strait Islander Cultures									

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 25%	•	•	•	•		•		•		
2 - Written Assessment - 25%	•	•	•	•		•		•		
3 - Written Assessment - 50%	•	•	•	•		•		•		

Textbooks and Resources

Textbooks

MATH13217

Prescribed

Calculus : Concepts and Contexts
Edition 4 (2018)
Authors: Stewart, J.
Brooks-Cole, Cengage Learning
Belmont , CA , U.S.A.
ISBN: 9781337687669
Binding: Hardcover

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Yucang Wang Unit Coordinator
y.wang2@cqu.edu.au

Schedule

Week 1 - 05 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Three Dimensional Coordinate Systems, Vectors, The Dot and Cross Product, Equations of Lines and Planes, Functions and Surfaces, Cylindrical and Spherical Coordinates	All of Chapter 9	

Week 2 - 12 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions, Arc Length and Curvature, Motion in Space	Sections 10.1 to 10.4	

Week 3 - 19 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic

Parametric Surfaces, Functions of Several Variables, Limits and Continuity, Partial Derivatives, Tangent Planes and Linear Approximations	Section 10.5 plus Sections 11.1 to 11.4 (part)	

Week 4 - 26 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Differentials, The Chain Rule and Implicit Differentiation, Directional Derivatives and the Gradient Vector	Sections 11.4 to 11.6	

Week 5 - 02 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Maximum and Minimum Values, Lagrange Multipliers	Sections 11.7 & 11.8	

Vacation Week - 09 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 16 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Double Integrals over Rectangles and General Regions, Double Iterated Integrals, Double Integrals in Polar Coordinates	Sections 12.1 to 12.4	**Assignment 1** Due: Week 6 Friday (20 Apr 2018) 11:00 pm AEST

Week 7 - 23 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Applications of Double Integrals, Surface Area	Sections 12.5 & 12.6	

Week 8 - 30 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Triple Integrals and Triple Integrals in Cylindrical and Spherical Coordinates	Sections 12.7 & 12.8	

Week 9 - 07 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Change of Variables in Multiple Integrals, Vector Fields, Line Integrals	Section 12.9 plus Sections 13.1 & 13.2	

Week 10 - 14 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
The Fundamental Theorem for Line Integrals, Green's Theorem	Sections 13.3 & 13.4	**Assignment 2** Due: Week 10 Friday (18 May 2018) 11:00 pm AEST

Week 11 - 21 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Curl and Divergence, Surface Integrals	Sections 13.5 & 13.6	

Week 12 - 28 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Stoke's Theorem, The Divergence Theorem, Summary	Sections 13.7 to 13.9	

Review/Exam Week - 04 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 11 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic
		Written Assessment Due: Exam Week Friday (15 June 2018) 11:00 pm AEST

Assessment Tasks

1 Assignment 1

Assessment Type
Written Assessment

Task Description
Submit full worked solutions to exercises selected from the Stewart Textbook. The exercises cover topics from Weeks 1 to 5 of the course. The selected exercises and other details are given on the Moodle website.

Assessment Due Date
Week 6 Friday (20 Apr 2018) 11:00 pm AEST
Submit by 11pm on Friday of Week 6

Return Date to Students
Week 8 Friday (4 May 2018)
Results will be available to students approximately two weeks after the submission date.

Weighting
25%

Assessment Criteria
Full details about assignment 1 are available on the Moodle website.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Assignment 1 must be submitted online through the MATH13217 Moodle website.

Learning Outcomes Assessed

- Solve geometric problems in three dimensional space using vectors and their operators.
- Calculate derivatives and integrals of vector functions to solve problems involving arc length and curvature of space curves.
- Apply the concept of the limit, continuity and partial derivative of a function of many variables as well as calculate tangent planes, linear approximations and differentials.
- Apply the chain rule, directional derivatives and the gradient vector to solve problems, particularly multivariable optimisation problems either with or without constraints.
- Use mathematical software to visualise, analyse and solve problems in multivariable calculus.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence
- Ethical practice

2 Assignment 2

Assessment Type
Written Assessment

Task Description
Submit full worked solutions to exercises selected from the Stewart Textbook. The exercises cover topics from Weeks 6 to 9 of the course. The selected exercises and other details are given on the Moodle website.

Assessment Due Date
Week 10 Friday (18 May 2018) 11:00 pm AEST
Submit by 11pm on Friday of Week 10

Return Date to Students
Week 12 Friday (1 June 2018)
Results will be available to students approximately two weeks after the submission date.

Weighting
25%

Assessment Criteria
Full details about assignment 2 are available on the Moodle website.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Assignment 2 must be submitted online through the MATH13217 Moodle website.

Learning Outcomes Assessed

- Calculate double & triple integrals over general regions, and also in polar, cylindrical and spherical coordinates.
- Apply the change of variables technique to simplify the evaluation of a double or triple integral.
- Use mathematical software to visualise, analyse and solve problems in multivariable calculus.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence
- Ethical practice

3 Written Assessment

Assessment Type
Written Assessment

Task Description
The take home exam will be available in the Moodle course website on Friday, 4 May 2018 at 9:00 am. You have to answer all questions showing full working. Submit your answers hand-written or typed or combination online in pdf, doc, docx or rtf format.

Assessment Due Date
Exam Week Friday (15 June 2018) 11:00 pm AEST
Submit by 11pm on Friday of Exam Week

Return Date to Students

The take home exam papers will be returned to the students after the certification date.

Weighting
50%

Assessment Criteria
Marks will be allocated on working, presentation, and conclusions.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit online in pdf, doc, docx or rtf format with a total size less than 50 MB

Learning Outcomes Assessed

- Solve geometric problems in three dimensional space using vectors and their operators.
- Calculate derivatives and integrals of vector functions to solve problems involving arc length and curvature of space curves.
- Apply the concept of the limit, continuity and partial derivative of a function of many variables as well as calculate tangent planes, linear approximations and differentials.
- Apply the chain rule, directional derivatives and the gradient vector to solve problems, particularly multivariable optimisation problems either with or without constraints.
- Calculate double & triple integrals over general regions, and also in polar, cylindrical and spherical coordinates.
- Apply the change of variables technique to simplify the evaluation of a double or triple integral.
- Evaluate line integrals both in space and of vector fields, plus solve problems involving the curl and divergence of a vector field.
- Calculate the surface integral of a scalar function or of a vector field, plus use Green's theorem, Stokes' Theorem and the Divergence Theorem to solve problems.
- Use mathematical software to visualise, analyse and solve problems in multivariable calculus.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence
- Ethical practice

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem