

# MATH13217 Advanced Calculus Term 1 - 2019

#### Profile information current as at 12/05/2024 02:06 am

All details in this unit profile for MATH13217 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

# **General Information**

# Overview

In this unit, you will study 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, you will investigate derivatives and integrals of vector functions with applications to arc length, curvature of space curves and motion in space. 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. You will study multiple integrals 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 you 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 you will investigate the calculus of vector fields, line integrals and surface integrals. 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.

# 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 Anti-requisite: MATH12172

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 <u>Assessment Policy and</u> <u>Procedure (Higher Education Coursework)</u>.

# Offerings For Term 1 - 2019

• Online

# **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

<u>Metropolitan Campuses</u> Adelaide, Brisbane, Melbourne, Perth, Sydney

### Assessment Overview

 Written Assessment Weighting: 25%
Written Assessment Weighting: 25%
Examination 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 <u>University's Grades and Results Policy</u> for more details of interim results and final grades.

# **CQUniversity Policies**

### All University policies are available on the <u>CQUniversity Policy site</u>.

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 <u>CQUniversity Policy site</u>.

# 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 evaluation

### Feedback

Zoom sessions close to assessment due dates for any questions/struggles on coursework would be useful.

### Recommendation

Open Zoom sessions to support students.

### Feedback from Student evaluation

### Feedback

Lots of material is available to support learning, along with textbook.

### Recommendation

Keep the textbook for this unit.

### Feedback from Student evaluation

### Feedback

The University of Missouri video lectures were helpful.

### Recommendation

Keep the University of Missouri video lectures.

# **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. Differentiate and integrate 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 to calculate tangent planes, linear approximations and differentials
- 4. Optimise multivariable problems, either with or without constraints, using the chain rule, directional derivatives and the gradient vector
- 5. Calculate double and triple integrals over general regions, and also in polar, cylindrical and spherical coordinates
- 6. Simplify the evaluation of a double or triple integral by applying the change of variables technique
- 7. Solve problems involving the curl and divergence of a vector field
- 8. Investigate the calculus of vector fields, line integrals and surface integrals through Green's theorem, Stokes' Theorem and the Divergence Theorem
- 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	0	Professional Level	0	Advanced Level	
Alignment of Assessment Tasks to Learning Outsernes												

## Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes										
	1	2	3	4	5	6	7	8	9		
1 - Written Assessment - 25%	٠	٠	٠	٠					٠		

Assessment Tasks	Lea	arnin	g Out	tcom	es				
	1	2	3	4	5	6	7	8	9
2 - Written Assessment - 25%					•	•			•
3 - Examination - 50%	٠	٠	٠	٠	٠	٠	٠	٠	

# 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 - Examination - 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

### **Additional Textbook Information**

You may have purchased this book in a previous unit. However, you can check and if needed, purchase at the CQUni Bookshop here: <u>http://bookshop.cqu.edu.au</u> (search on the Unit code)

### 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: <u>Harvard (author-date)</u> For further information, see the Assessment Tasks.

# **Teaching Contacts**

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

# Schedule

Week 1 - 11 Mar 2019		
Module/Topic	Chapter	<b>Events and Submissions/Topic</b>
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 - 18 Mar 2019		
Module/Topic	Chapter	<b>Events and Submissions/Topic</b>
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 - 25 Mar 2019		
Module/Topic	Chapter	<b>Events and Submissions/Topic</b>

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 - 01 Apr 2019		
Module/Topic	Chapter	<b>Events and Submissions/Topic</b>
Differentials, The Chain Rule and Implicit Differentiation, Directional Derivatives and the Gradient Vector	Sections 11.4 to 11.6	
Week 5 - 08 Apr 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Maximum and Minimum Values, Lagrange Multipliers	Sections 11.7 & 11.8	
Vacation Week - 15 Apr 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Week 6 - 22 Apr 2019		
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 (26 Apr 2019) 11:00 pm AEST
Week 7 - 29 Apr 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Applications of Double Integrals, Surface Area	Sections 12.5 & 12.6	
Week 8 - 06 May 2019		
Module/Topic	Chapter	<b>Events and Submissions/Topic</b>
Triple Integrals and Triple Integrals in Cylindrical and Spherical Coordinates	Sections 12.7 & 12.8	
Week 9 - 13 May 2019		
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 - 20 May 2019		
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 (24 May 2019) 11:00 pm AEST
Week 11 - 27 May 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Curl and Divergence, Surface Integrals	Sections 13.5 & 13.6	
Week 12 - 03 Jun 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Stoke's Theorem, The Divergence Theorem, Summary	Sections 13.7 to 13.9	
Review/Exam Week - 10 Jun 2019		
Module/Topic	Chapter	Events and Submissions/Topic
Exam Week - 17 Jun 2019		

## Assessment Tasks

### 1 Assignment 1

#### Assessment Type Written Assessment

written Assessmen

### **Task Description**

Submit full worked solutions to Assignment 1 exercises. 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 (26 Apr 2019) 11:00 pm AEST Submit by 11pm on Friday of Week 6

### **Return Date to Students**

Week 8 Friday (10 May 2019) Results will be available to students approximately two weeks after the submission date.

### Weighting

25%

### Assessment Criteria

The final mark is out of 25. Questions are awarded the full marks allocated if they are error-free, partial marks if there are some problems, and no marks if not attempted or contain so many errors as to render the attempt to be without value. To ensure maximum benefit, answers to all questions should be neatly and clearly presented and all appropriate working should be shown.

### **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
- Differentiate and integrate 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 to calculate tangent planes, linear approximations and differentials
- Optimise multivariable problems, either with or without constraints, using the chain rule, directional derivatives and the gradient vector
- 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 Assignment 2 exercises. 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 (24 May 2019) 11:00 pm AEST Submit by 11pm on Friday of Week 10

### **Return Date to Students**

Week 12 Friday (7 June 2019) Results will be available to students approximately two weeks after the submission date.

### Weighting

25%

### **Assessment Criteria**

The final mark is out of 25. Questions are awarded the full marks allocated if they are error-free, partial marks if there are some problems, and no marks if not attempted or contain so many errors as to render the attempt to be without value. To ensure maximum benefit, answers to all questions should be neatly and clearly presented and all appropriate working should be shown.

### **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 and triple integrals over general regions, and also in polar, cylindrical and spherical coordinates
- Simplify the evaluation of a double or triple integral by applying the change of variables technique
- 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

# Examination

### Outline

Complete an invigilated examination.

### Date

During the examination period at a CQUniversity examination centre.

Weighting

50%

Length 180 minutes

Minimum mark or grade 40%

**Exam Conditions** 

Open Book.

### Materials

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments). Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

# 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 <u>Academic Learning Centre (ALC)</u> can support you in becoming confident in completing assessments with integrity and of high standard.

### What can you do to act with integrity?





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