



# MATH12224 *Calculus and Linear Algebra B*

## Term 2 - 2020

Profile information current as at 28/04/2024 08:38 pm

All details in this unit profile for MATH12224 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

The unit covers topics in single variable integral calculus and linear algebra. The fundamental theorem of calculus is studied as well as various techniques for evaluating integrals like the substitution rule, integration by parts, trigonometric substitution, and various numerical approximations. A number of applications of integral calculus are investigated including finding the area between curves, the volume of solids and cylindrical shells, the length of a curve, the average value of a function, as well as applications in physics and engineering. Modelling real world problems with differential equations is studied along with techniques for solving first order differential equations using direction fields and Euler's method, or using methods for separable equations. The use of differential equations to formulate exponential and logistic models of various growth and decay processes is also investigated. Matrices are revisited with particular focus on the determinant of a matrix and how it can be used to solve linear systems of equations. Finally, infinite sequences and series are studied along with methods of determining if they converge or diverge. The use of power series to integrate and differentiate functions is investigated with particular emphasis on the Taylor and Maclaurin series representation of a function. Mathematical software is also used to analyse and solve most problems studied in the unit. Note: If you have completed unit MATH11164 then you cannot take this unit.

### Details

Career Level: *Undergraduate*

Unit Level: *Level 2*

Credit Points: 6

Student Contribution Band: 7

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisite: MATH12223 Calculus and Linear Algebra A

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 2 - 2020

- Online
- Rockhampton

### 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: 20%

#### 2. **Written Assessment**

Weighting: 20%

#### 3. **Take Home Exam**

Weighting: 60%

### 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 evaluation

**Feedback**

Another practice exam would be beneficial.

**Recommendation**

Two practice exam papers have already been provided. The 2019 Standard Exam paper will be included as an additional 'practice exam' in 2020. This stock of practice exam papers will grow annually.

#### Feedback from Student evaluation

**Feedback**

Students appreciated the comparison between University mathematics units and the modern senior school mathematics syllabus that helped to contextualise coursework.

**Recommendation**

Continue this practice.

#### Feedback from Student evaluation

**Feedback**

Sufficient explanation and worked examples helped students in understanding and learning mathematics.

**Recommendation**

Continue this practice.

## Unit Learning Outcomes

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

1. Assess and apply the fundamental theorem of calculus
2. Evaluate definite and indefinite integrals using the substitution rule, integration by parts, trigonometric substitution and other numerical approximations
3. Critically analyse and apply integral calculus to problems of calculating areas, volumes, lengths, average values and other applications in physics and engineering
4. Model problems with differential equations with a particular focus on exponential and logistic models
5. Solve first order differential equations using direction fields and Euler's method, or using methods for separable equations
6. Use the determinant of a matrix to solve a system of linear equations
7. Analyse the convergence and divergence of infinite sequences or series with particular focus on power series
8. Calculate a Taylor or Maclaurin series representation of a function and use it to integrate or differentiate a function
9. Use mathematical software to visualise, analyse, and solve problems in single variable integral calculus and linear algebra.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
1 - Written Assessment - 20%	•	•							•
2 - Written Assessment - 20%			•	•	•				•
3 - Take Home Exam - 60%	•	•	•	•	•	•	•	•	

### 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 - 20%	•	•	•	•		•		•		
2 - Written Assessment - 20%	•	•	•	•		•		•		
3 - Take Home Exam - 60%	•	•	•	•				•		

## Textbooks and Resources

### Textbooks

**There are no required textbooks.**

#### Additional Textbook Information

As MATH12223 is the prerequisite for MATH12224, those students who passed MATH12223 in Term 1 of 2019/20 can keep using the same textbook for MATH12224 in Term 2 of 2020.

For students who passed MATH12223 prior to 2019, you may choose to use the extracted PDF file on Moodle or purchase a copy of the textbook from the Bookshop: "**Essentials and Examples of Applied Mathematics**" (1st edn, ISBN 9781488623820) by William Guo, Pearson Australia (2018). Paper copies are available on the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search MATH11160)

### 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

**William Guo** Unit Coordinator  
[w.guo@cqu.edu.au](mailto:w.guo@cqu.edu.au)

## Schedule

### Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Unit Introduction Review of Differentials Fundamentals of Indefinite integrals	Section 11.3.1 Differentials of Functions Section 12.1 Fundamentals of Indefinite integrals	Read Sections 11.3.1 & 12.1 Complete Week 1 exercises

### Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Integration by Substitution	Section 12.2.1 Integration by Substitution	Read Section 12.2.1; complete Week 2 exercises

### Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Integration by Parts	Section 12.2.2 Integration by Parts	Read Section 12.2.2; complete Week 3 exercises

### Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Integration by Complete Differentials and Partial Fractions	Sections 12.2.3-12.2.4 Integration by Complete Differentials and Partial Fractions	Read Sections 12.2.3-12.2.4; complete Week 4 exercises

Week 5 - 10 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Applications of Indefinite Integration	Section 12.3 Applications of Indefinite Integration	Read Section 12.3; complete Week 5 exercises
Vacation Week - 17 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Week 6 - 24 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Essentials of Definite Integration	Section 13.1 Essentials of Definite Integration	Read Section 13.1; complete Week 6 exercises  <b>Assignment 1</b> Due: Week 6 Wednesday (26 Aug 2020) 11:59 pm AEST
Week 7 - 31 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Applications of Definite Integration (I)	Section 13.2.1 Applications of Definite Integration	Read Section 13.2.1; complete Week 7 exercises
Week 8 - 07 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Applications of Definite Integration (II)	Sections 13.2.1-13.2.2 Applications of Definite Integration	Read Sections 13.2.1-13.2.2; complete Week 8 exercises
Week 9 - 14 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Numeric Integration	Section 16.3 Numeric Integration	Read Section 16.3; complete Week 9 exercises
Week 10 - 21 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Solving Systems of Linear Equations (I)	Sections 15.1 and 15.2.1 Solving Systems of Linear Equations	Read Sections 15.1 & 15.2.1; complete Week 10 exercises
Week 11 - 28 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Solving Systems of Linear Equations (II)	Sections 15.2.2 and 15.2.3 Solving Systems of Linear Equations	Read Sections 15.2.2 & 15.2.3; complete Week 11 exercises
Week 12 - 05 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Examination preview and preparation		<b>Assignment 2</b> Due: Week 12 Wednesday (7 Oct 2020) 11:59 pm AEST
Review/Exam Week - 12 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Exam Week - 19 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic

## Assessment Tasks

# 1 Assignment 1

## Assessment Type

Written Assessment

## Task Description

This is an individual assignment.

This assignment is to test student's learning outcomes of topics studied in Weeks 1-5. The assignment details are provided on the Moodle website.

## Assessment Due Date

Week 6 Wednesday (26 Aug 2020) 11:59 pm AEST

## Return Date to Students

Week 8 Wednesday (9 Sept 2020)

It is envisaged that feedback and solutions will be available in two weeks, or as soon as the process is completed.

## Weighting

20%

## Assessment Criteria

The final mark is out of 20. 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. Assignments will receive NO marks if submitted after the solutions are released.

## Referencing Style

- [Harvard \(author-date\)](#)

## Submission

Online

## Submission Instructions

Submit one PDF file through the Moodle website.

## Learning Outcomes Assessed

- Assess and apply the fundamental theorem of calculus
- Evaluate definite and indefinite integrals using the substitution rule, integration by parts, trigonometric substitution and other numerical approximations
- Use mathematical software to visualise, analyse, and solve problems in single variable integral calculus and linear algebra.

## Graduate Attributes

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

# 2 Assignment 2

## Assessment Type

Written Assessment

## Task Description

This is an individual assignment.

This assignment is to test student's learning outcomes of topics studied in Weeks 6-11. The assignment details are provided on the Moodle website.

## Assessment Due Date

Week 12 Wednesday (7 Oct 2020) 11:59 pm AEST

## Return Date to Students

It is envisaged that feedback and solutions will be available prior to sitting the standard examination.

**Weighting**

20%

**Assessment Criteria**

The final mark is out of 20. 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. Assignments will receive NO marks if submitted after the solutions are released.

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Online

**Submission Instructions**

Submit one PDF file through the Moodle website.

**Learning Outcomes Assessed**

- Critically analyse and apply integral calculus to problems of calculating areas, volumes, lengths, average values and other applications in physics and engineering
- Model problems with differential equations with a particular focus on exponential and logistic models
- Solve first order differential equations using direction fields and Euler's method, or using methods for separable equations
- Use mathematical software to visualise, analyse, and solve problems in single variable integral calculus and linear algebra.

**Graduate Attributes**

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

### 3 Take Home Exam

**Assessment Type**

Take Home Exam

**Task Description**

Due to uncertainties of recovery post the COVID-19 pandemic, the Standard Examination for Term 2 of 2020 MATH12224 is temporarily replaced by a Take Home Exam. You are given 24 hours to work on the Take Home Exam. During the 24-hour timeframe, you will need to download the exam from the unit's Moodle website, complete it and upload it back. Detailed instructions for the Take Home Exam will be communicated near the end of Term 2.

**Assessment Due Date**

The Take Home Exam will be scheduled during the Exam Week.

**Return Date to Students**

The results will be made available on Certification of Grades day. Like a regular exam, your marked answer script will not be returned to you, unless you apply to see it as part of the first step of the review of grade process.

**Weighting**

60%

**Minimum mark or grade**

24 (40% of 60 marks)

**Assessment Criteria**

This assessment task is open book. You can reference all notes and study materials. Any submission after the deadline will not be accepted. You are required to do your own work, maintaining academic integrity with all honesty. Your submission may be subject to additional verification in the form of an oral defence through interview with the Unit Coordinator (or nominee). Students unable to satisfactorily answer questions about their submitted solution(s) will receive no marks for the question(s).

Answered 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**

Submit one file through the Moodle website.

### **Learning Outcomes Assessed**

- Assess and apply the fundamental theorem of calculus
- Evaluate definite and indefinite integrals using the substitution rule, integration by parts, trigonometric substitution and other numerical approximations
- Critically analyse and apply integral calculus to problems of calculating areas, volumes, lengths, average values and other applications in physics and engineering
- Model problems with differential equations with a particular focus on exponential and logistic models
- Solve first order differential equations using direction fields and Euler's method, or using methods for separable equations
- Use the determinant of a matrix to solve a system of linear equations
- Analyse the convergence and divergence of infinite sequences or series with particular focus on power series
- Calculate a Taylor or Maclaurin series representation of a function and use it to integrate or differentiate a function

### **Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- 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