



MATH2020

Vector Calculus and Complex Analysis

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Mathematical and Physical Sciences

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Disclaimer

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General Information

Unit convenor and teaching staff

Convenor

Frank Valckenborgh

frank.valckenborgh@mq.edu.au

Contact via email

12WW 613

Lecturer

Paul Bryan

paul.bryan@mq.edu.au

Contact via email

12WW 706

Credit points

10

Prerequisites

MATH2010 or MATH2055

Corequisites

Co-badged status

Unit description

The topics covered in this unit lay the foundations for further study in modern areas of mathematics (such as partial differential equations, fluid mechanics, and mathematical biology). This unit builds on the first year single variable calculus units by extending calculus to several variables, and focuses primarily on integration techniques for complex functions and vector fields. Complex analysis is the study of complex-valued functions of complex variables. The main properties of complex functions of a single complex variable will be presented, including the important concepts of analyticity and singularity structure. This will be followed by a treatment of Cauchy's theorem and the residue theorem to evaluate contour integrals of complex functions around various curves in the complex plane. Vector calculus is the study of vector fields in two and three dimensions, and facilitates the modelling of a variety of physical phenomena, for example in fluid mechanics and electromagnetism. By introducing the gradient, divergence and curl operators, the main properties of vector fields can be analysed. A variety of integrals of vector fields over paths, surfaces and volumes will be performed, and the application of three important integral theorems of vector calculus due to Green, Stokes and Gauss to evaluate these integrals will be demonstrated.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

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

ULO1: Analyse the main properties of functions of a single complex variable, such as analyticity and singularity structure.

ULO2: Evaluate contour integrals of complex functions by applying Cauchy's theorem and the residue theorem.

ULO3: Analyse the main properties of vector fields using the gradient, divergence and curl operators.

ULO4: Evaluate path, surface and volume integrals of vector fields.

ULO5: Apply the important theorems due to Green, Stokes and Gauss to physical applications.

General Assessment Information

Release

The assignment will be released no later than 16 October.

Requirements to pass this unit

Achieve a total mark greater than or equal to 50%.

Attendance and participation

We strongly encourage all students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience technical concerns. For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for [Special Consideration](#). For example, if the assignment is worth 8 marks (of the

entire unit) and your submission is late by 19 hours (or 23 hours 59 minutes 59 seconds), 0.4 marks (5% of 8 marks) will be deducted. If your submission is late by 24 hours (or 47 hours 59 minutes 59 seconds), 0.8 marks (10% of 8 marks) will be deducted, and so on.

Assessments where Late Submissions will be accepted

Assignment – YES, Standard Late Penalty applies.

Skills Exercise - NO, unless Special Consideration is Granted.

Final Exam - NO, unless Special Consideration is Granted.

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through <https://connect.mq.edu.au>.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Final Exam	50%	No	Exam Period	Individual	No	Observed
Skills exercise	25%	No	In week 8, during the SGTA in which you are registered.	Individual	No	Observed
Assignment	25%	No	01/11/2026	Individual	Yes	Open

Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 20 hours

Due: **Exam Period**

Weighting: **50%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

You will undertake a final examination during the formal examination period.

On successful completion you will be able to:

- Analyse the main properties of functions of a single complex variable, such as analyticity and singularity structure.
- Evaluate contour integrals of complex functions by applying Cauchy's theorem and the

residue theorem.

- Analyse the main properties of vector fields using the gradient, divergence and curl operators.
- Evaluate path, surface and volume integrals of vector fields.
- Apply the important theorems due to Green, Stokes and Gauss to physical applications.

Skills exercise

Assessment Type ¹: Practice-based task

Indicative Time on Task ²: 15 hours

Due: **In week 8, during the SGTA in which you are registered.**

Weighting: **25%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

Exercises designed to develop and assess mathematical skills, reinforcing theoretical knowledge to promote mastery of essential concepts.

On successful completion you will be able to:

- Analyse the main properties of functions of a single complex variable, such as analyticity and singularity structure.
- Evaluate contour integrals of complex functions by applying Cauchy's theorem and the residue theorem.
- Analyse the main properties of vector fields using the gradient, divergence and curl operators.
- Evaluate path, surface and volume integrals of vector fields.
- Apply the important theorems due to Green, Stokes and Gauss to physical applications.

Assignment

Assessment Type ¹: Problem-based task

Indicative Time on Task ²: 15 hours

Due: **01/11/2026**

Weighting: **25%**

Groupwork/Individual: Individual

Short extension ³: Yes

AI Approach: Open

The assignment will test the ability of students to apply mathematical concepts and techniques to problem solving and includes a report building on a covered topic.

On successful completion you will be able to:

- Analyse the main properties of functions of a single complex variable, such as analyticity and singularity structure.
 - Evaluate contour integrals of complex functions by applying Cauchy's theorem and the residue theorem.
 - Analyse the main properties of vector fields using the gradient, divergence and curl operators.
 - Evaluate path, surface and volume integrals of vector fields.
 - Apply the important theorems due to Green, Stokes and Gauss to physical applications.
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¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- [Academic Success](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

Classes

Lectures (beginning in Week 1): There are two one-hour lectures each week.

SGTA classes (beginning in Week 2): There is one two-hour SGTA each week.

The timetable for classes can be found on the University website at: <https://publish.mq.edu.au/>.

Enrolment can be managed using eStudent at: <https://students.mq.edu.au/support/technology/systems/estudent>.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn.

Queries to convenors can either be placed on the iLearn discussion board or sent to your lecturers from your university email address.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)

- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Academic Success

[Academic Success](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Ask a Study Coach](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)

- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit <https://students.mq.edu.au/support/technology/service-desk>.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Unit information based on version 2026.02 of the [Handbook](#)