Table of Contents

Contents and Introduction

Table of Contents
Legal Information
Preface
Acknowledgements

1 Sets and Functions

1.1 Sets
1.2 Numbers and intervals
1.3 Functions
1.4 Graphs of functions
1.5 Trigonometric functions
1.6 Basic trigonometric identities
1.7 Exponentials and logarithms
Review Problems
Challenge Problems
1.A Relationship between trigonometric functions and exponentials

2 Limits and Continuity

2.1 Limits
2.2 Continuity
Review Problems
Challenge Problems
2.A Proofs of some continuity results

3 The Derivative

3.1 Intuitive introduction
3.2 Definition of the derivative
3.3 Basic derivative computations
3.4 The Chain Rule for derivatives
3.5 Rolle's Theorem and the Mean Value Theorem
3.6 Implicit differentiation
3.7 Summary of derivative computation
Review Problems
Challenge Problems
3.A Proof of the Chain Rule
3.B Proof of the Mean Value Theorem

4 Applications of the Derivative

4.1 Graphical interpretation of the derivative
4.2 Extrema and optimization
4.3 Velocity
4.4 Tangent line approximation
4.5 Newton's Method
4.6 Related rates
Review Problems
Challenge Problems

5 Integration

5.1 Area under a curve
5.2 The Fundamental Theorem of Calculus
5.3 Integration methods
- 5.3.1 Definition and basic examples
- 5.3.2 Antiderivatives of common functions
- 5.3.3 The Chain Rule
- 5.3.4 Integration by parts
- 5.3.5 Substitution methods
- 5.3.6 Partial fractions
- 5.3.7 A monster example
- 5.3.8 Exercises

5.4 Applications of the definite integral
- 5.4.1 Areas of regions in the plane
- 5.4.2 Volumes
- 5.4.3 Length of a curve
- 5.4.4 Average value of a function
- 5.4.5 Exercises

5.5 Approximation techniques
Review Problems
Challenge Problems
5.A Formal definitions of log and exp
5.B Simpson's Rule

6 Infinity

6.1 Limits towards infinity
6.2 Limits of infinity
6.3 Rational indeterminate forms and l'Hopital's Rule
6.4 Exponential indeterminate Forms
6.5 Improper integrals
Review Problems
Challenge Problems
6.A Proof of L'Hopital's Rule

7 Series

7.1 Infinite sequences
7.2 Infinite series
7.3 Series convergence tests
7.4 Alternating series
7.5 Taylor polynomials
7.6 Taylor series
Review Problems
Challenge Problems
7.A A strange formula for pi

8 Plane Curves

8.1 Parametric curves
8.2 Polar coordinates
8.3 Areas in polar coordinates
Review Problems
Challenge Problems

9 Differential Equations

9.1 Definitions and basic examples
9.2 Second-order linear differential equations
Review Problems
Challenge Problems
9.A Euler's Method

End-of-book Notes

Epilogue
References