# $MAU11201 \ Calculus - List \ of \ topics$

## 1. Functions

- 1.1 Domain and range
- 1.2 Injective, surjective and bijective
- 1.3 Quadratic functions
- 1.4 Polynomial functions
- 1.5 Trigonometric functions
- 1.6 Exponential functions
- 1.7 Inverse functions

## 2. Limits and continuity

- 2.1 Introduction to limits
- 2.2 Definition of limits
- 2.3 One-sided limits
- 2.4 Properties of limits
- 2.5 Definition of continuity
- 2.6 Properties of continuous functions
- 2.7 Intermediate value theorem
- 2.8 Infinite limits
- 2.9 Limits at infinity

## 3. Differentiation

- 3.1 Definition of derivative
- 3.2 Rules of differentiation
- 3.3 Derivatives of standard functions
- 3.4 Derivatives of inverse functions
- 3.5 Chain rule
- 3.6 Implicit differentiation
- 3.7 Logarithmic differentiation
- $3.8~{\rm Mean}$  value theorem

## 4. Applications of derivatives

- 4.1 L'Hôpital's rule
- 4.2 Monotonicity
- 4.3 Concavity
- 4.4 Local minima and maxima
- 4.5 Global minima and maxima
- 4.6 Optimisation
- 4.7 Related rates
- 4.8 Linear approximation
- 4.9 Newton's method

## 5. Integration

- 5.1 Definite integral
- 5.2 Rules of integration
- 5.3 Fundamental theorem of calculus
- 5.4 Integrals of standard functions
- 5.5 Area, volume and arc length
- 5.6 Mass, centre of mass and work
- 5.7 Improper integrals

## 6. Techniques of integration

- 6.1 Integration by parts
- 6.2 Integration by substitution
- 6.3 Reduction formulas
- 6.4 Trigonometric integrals
- 6.5 Trigonometric substitutions
- 6.6 Partial fractions

## 7. Sequences and series

- 7.1 Convergence of sequences
- 7.2 Convergence of series
- 7.3 Integral test
- 7.4 Comparison tests
- $7.5~\mathrm{Ratio}$  test
- 7.6 Absolute convergence
- 7.7 Alternating series test
- 7.8 Power series