



University of Sri Jayewardenepura
Department of Mathematics
Semester 2 - 2018
MAT 122 2.0 Calculus

Lecturer-in-Charge	Duration	Lecture Hall	Time
Dr. G.H. J. Lanel	30 Hours	Science Auditorium	Wednesday: 8-9.45a.m.

Objectives

This course is the continuation of Fundamentals of logic and set theory course unit. Advanced topics such as limit concept, continuity, differentiability and Roll's theorem, Mean value theorem and their applications will be taught. Practical Maple course run concurrently, enabling the students to grasp the concepts profoundly.

Intended Syllabus

1. Real Sequences
 - 1.1. Sequences and Sub-sequences
 - 1.2. Monotonic and Bounded sequences
 - 1.3. Limit of a sequence
 - 1.4. Convergent and Divergent sequences
 - 1.5. Limit laws
 - 1.6. Limits of some important sequences
2. Series
 - 2.1. Infinite series
 - 2.2. Necessary condition for convergent

2.3. Series with positive terms

2.3.1 Convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^p}$

2.3.2 Comparison tests

2.4. Alternating series

2.5. Absolute convergence and Conditionally convergence

2.6. Ratio test and Root test

2.7. Rearrangement of series

2.8. Other tests

3. Piecewise continuous functions and Discontinuities

3.1. Limits involving infinity

3.2. Piecewise continuous functions and the nature of discontinuities (removable, infinity, jump and oscillatory discontinuities)

3.3. Asymptotes

4. The Derivative

4.1. Derivatives

4.2. Differential formulae

4.3. Higher derivatives

4.4. Indeterminate forms and L'Hospital's rule

5. The Mean Value theorem and Curve sketching

5.1. Maximum and minimum values

5.2. The Mean Value Theorem

5.3. Monotonic functions and the first derivative test

5.4. Concavity and points of inflection

5.5. Curve sketching

5. Power Series

5.1. Representation of functions as power series

5.2. Taylor's and Maclaurin's series

5.3. The Binomial series

Recommended Readings

1. *Calculus* (5th edition) by **James Stewart** (This is the Course Text Book)
2. *Calculus* (9th edition) by **Thomas and Finny**

Learning Outcomes

At the end of the course, students will be able to prove that the sequence is monotone and bounded, show that the sequence is convergent/ divergent, find the limit of the sequences using the limit theorems, test a series for convergent, absolutely convergence, conditionally convergent and divergence, understand the calculus concepts of limit of a function and apply it in variety of contexts, state the nature of discontinuity with the reason, find the asymptotes of the curves, apply certain mean value theorems for differentiable functions e.g. Roll's theorem, and apply them to sketch curves, find local minimum and maximum points and also points of inflection of curves and use them to sketch curves, find the interval of convergence of the power series, obtain the Taylor's series expansion of a function about a given point understand what is meant by the radius of convergence of a power series, and apply what they have learned using Maple, e.g. limits, tangent lines, derivatives, points of inflection, sketching curves.

Assessment Criterion

Assignments and Quizzes	30%
End of Semester Examination	70%

Method of Continuous Assessment

1. Assignments will be assigned frequently and will always be evaluated.
2. Unannounced quizzes will be given at the end of randomly selected lectures. The quizzes are open-ended, and all will be done individually or as group activities.

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