**Lesson 0**

Proofs

Converse, Inverse and Contrapositive

Direct Proof

Proof by contradiction (Contrapositive Proof)

*AKA indirect proof*

Proof by induction

**Lesson 0**

Limit of a sequence

a) converging sequences

b) sequences tending to infinity

c) sub-sequences

d) Cauchy sequence

**Lesson 0**

Series

Convergence

Absolute Convergence

Conditional convergence/divergence

Interaction of infinite series (nth partial sums)

Vanishing condition (establish divergence of series)

Series test (first/second comparison test)

D’Alembert’s ratio test

Alternating series test

Ratio test - Radius interval of convergence of a power series

Lesson 0

Limit to continuous functions

Definitions

Limit Laws (sum, product, quotient, composite, sandwich rule)

Continuity (LHS, RHS)

Continuity Laws (sum, product, quotient, composite, sandwich rule)

First principles () and continuity

Boundedness property (max/min value)

Intermediate value property

Interval theorem

Lesson 0

Differentiability

LHS-RHS derivative

Differentiability and continuous f

L Hopital’s rule

Min/Max values of functions using derivatives

Rolle’s theorem, mean value theorem, increasing/decreasing theorem

Lesson 0

Taylor Polynomials

Taylor polynomial of degree n

Taylore series for a function f

Taylor polynomial – estimate functions to a no of decimal place

Lesson 0

Riemann integral

Partition P upper/lower sum

Riemann integrability of a function bounded on [a,b]

a) supremum

b) f is monotone on [a,b]

c) f is continuous on [a,b]

Properties of Riemann intergrals

Anti-derivative

Lesson 0

Test Improper integrals for convergence/divergence

First – integration interval unbounded

Second – integrand unbounded over integration interval

Third - integrand unbounded AND integration interval unbounded

Limits – at point where function becomes unbounded OR where interval is unbounded

Limiting value of proper integral is calculated as integration intervals approach