

### **Week 1**

- Chapter 1. ( things )
- What is a number?
- Functions
- Implicit functions
- Inverse functions
- Inverse trigonometric functions

### **Week 2**

- Chapter 2. ( derivs )
- The tangent to a curve
- An example – tangent to a parabola
- Instantaneous velocity
- Rates of change
- Examples of rates of change

### **Week 3**

- Chapter 3. ( limits )
- Informal definition of limits
- "The formal, authoritative, definition of limit"
- Variations on the limit theme
- Properties of the Limit
- Examples of limit computations
- When limits fail to exist
- Limits that equal  $\infty$
- What's in a name? – Free Variables and Dummy variables
- Limits and Inequalities
- Continuity
- Substitution in Limits

### **Week 4**

- Two Limits in Trigonometry
- Asymptotes
- Chapter 4. ( derivs )
- Derivatives Defined
- Direct computation of derivatives
- Differentiable implies Continuous
- Some non-differentiable functions

### **Week 5**

- The Differentiation Rules
- Differentiating powers of functions
- Higher Derivatives
- Differentiating Trigonometric functions
- The Chain Rule
- Implicit differentiation

**Week 6**

- Chapter 5. ( graphs sketching )
- Tangent and Normal lines to a graph
- The Intermediate Value Theorem
- Finding sign changes of a function
- Increasing and decreasing functions
- Examples
- Maxima and Minima
- Must a function always have a maximum?
- Examples – functions with and without maxima or minima

**Week 7**

- General method for sketching the graph of a function
- "Convexity, Concavity and the Second Derivative"
- Optimization Problems
- Parametrized Curves

**Week 8**

- l'Hopital's rule
- Chapter 7. ( exp AND log )
- Exponents
- Logarithms
- Properties of logarithms
- Graphs of exponential functions and logarithms
- The derivative of  $a^x$  and the definition of  $e$
- Derivatives of Logarithms
- Limits involving exponentials and logarithms
- Exponential growth and decay

**Week 9**

- Chapter 8. ( integration )
- Area under a Graph
- When  $f$  changes its sign
- The Fundamental Theorem of Calculus
- The summation notation
- The indefinite integral
- Properties of the Integral

**Week 10**

- The definite integral as a function of its integration bounds
- Method of substitution
- Chapter 9. ( intapps )
- Areas between graphs

**Week 11**

- Cavalieri's principle and volumes of solids
- Three examples of volume computations of solids of revolution
- Volumes by cylindrical shells
- Distance from velocity

**Week 12**

- The length of a curve
- Velocity from acceleration
- Work done by a force