MIU-Math 221 Lecture schedule

Week 1

- **Chapter 1. Numbers and Functions**
- What is a number?
- Functions
- Implicit functions
- Inverse functions
- Inverse trigonometric functions

Week 2

- **Chapter 2. Derivatives**
- 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 and continuous functions**
- 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 ∞
- 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. Derivatives.**
- 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. Graphsketching an Max-min problems**
- 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. Exponentials and Logarithms**
- 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. The Integral**
- 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. Applications of the Integral.**
- 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