I. **Review Techniques of Integration**:
    Integration by Parts, Partial Fractions etc.

II **Improper Integrals**

Types of Improper Integrals
    Interval of integration includes positive and/or negative infinity
    Function becomes infinite somewhere on the interval of integration

Convergence
    Direct Comparison Test
    Limit Comparison Test

III. **Sequences and Subsequences**

Bounded Nondecreasing Sequence Thm
Sandwich Thm
Continuous Function Thm
    Use of L'Hopital's Rule
Common Limits from Table 8.1 (pg. 625)
What is a subsequence?
    {s} a convergent sequence with limit L $\Rightarrow$ every subsequence
        {q} of {s} converges to L
    {q} a divergent subsequence of sequence {s} $\Rightarrow$ {s} diverges
    {q} and {p} convergent subsequences of sequence {s}
        that converge to *different* limits $\Rightarrow$ {s} diverges
    {p} a convergent subsequence of {s} $\not\Rightarrow$ {s} is convergent
        (read this, does **not** imply)

IV. **Infinite Series**

General Categories
    Series of Numbers
        Important special case: geometric series and its limit
    Series of functions of a variable
        Power series
        Taylor series
            Special case: Maclaurin Series (expanded about zero)
    Characteristics of Series Elements for series of numbers,
    or series of functions of a variable when the variable is taken
    to assume a particular value or set of values
        Nonnegative series
        Telescoping series
        Alternating series
Tests for Convergence/Divergence
    Nth term test for *Divergence:* General Series
    Integral Test: Nonnegative Series
    Direct Comparison Test: Nonnegative Series

- Limit Comparison Test: Nonnegative Series
- Ratio Test: Nonnegative Series
- Nth Root Test: Nonnegative Series
- Leibnitz Test for Conditional Convergence: Alternating Series
- Use tests for nonnegative series on the absolute value of terms of series to test for absolute convergence: Alternating Series
- Absolute Conv. $\Rightarrow$ Conditional Conv: Alternating Series
- Conditional Conv. $\not\Rightarrow$ Absolute Conv: Alternating Series
- Absolute Conv$\Rightarrow$limit of series does does not vary when terms are rearranged
- Convergence Thm for Power Series
- How to Test for Convergence of Power Series
- Radius and Interval of Convergence: Power Series

Error Estimation

- Alternating Series Estimation Thm
- Taylor Remainder Formula: for Taylor/Maclaurin Series
- Taylor Remainder Estimation Thm: for Taylor/Maclaurin Series
- Important special case: finding bound for error of linearization

Applications of Power Series

- Term by Term Intgegration and Differentiation
- Obtaining new Taylor Series from old, ie. T(xe^x) = xT(e^x)
- Solving Differential Equations and Initial Value Problems
- Evaluating Nonelementary Integrals and Indeterminate Forms

V. **Polar Coordinates**

- Going back and forth between polar and cartesian coordinates
- Multiple equivalent sets of polar coordinates for a given point
- Graphing and finding intersections in polar coordinates

VI. **Vector Geometry**

- Direction and Magnitude components of vectors
- Dot Products, relation to orthogonality and angle between vectors
- Vector Projection, scalar component
- Cross Products, magnitude relation to area of spanned parallelogram
- Cross Products, direction relation to normal direction of spanned plane
- Equation for a plane
- Applications of Dot and Cross Products
    - Distance from Point to Line
    - Distance from Point to Plane
    - Intersection of a Line and a Plane
    - Angles between planes, using normal directions
    - Line parallel or perpendicular to plane through point(s)
    - Line through Point in a given Direction

Line through two Points
Volume of Paralleliped

VII. **Vector Valued Functions and Space Curves**
- Position Vector & Space Curves
- Continuity, Differentiability,
- Velocity Vector
  - magnitude of as "speed"
  - integral of magnitude as arclength
- Acceleration Vector
- Integrating Vector-valued Functions of a Single Variable
- Arclength, see Velocity Vector

VIII. **Multivariable Functions and Partial Derivatives**
- Domains, Ranges
- Open, Closed, Bounded, Unbounded Subsets of the Plane
- Limits & Continuity
  - Two-Path Test for Nonexistence of a Limit
- Level Curves and Level Surfaces
- Partial Derivatives, definition
- Critical Points
  - Classification Using Second Partials
  - Maxima and Minima on Closed, Bounded Regions
- Linearization of Functions of Two Variables
  - Bounding the Error of the Linearization
  - (a generalization of Taylor Remainder Thm)
- Predicting change with differentials
- The Chain Rule
  - Implicit Differentiation

VIII. **Gradients, Directional Derivatives and Tangent Planes**
- Gradient as normal to level curve or level surface of function
- Gradient as direction of maximum increase of function
  - magnitude as rate of maximal increase
  - negative gradient as direction of maximal decrease of function
  - negative magnitude as rate of maximal decrease
- Directional Derivative
  - computing, interpreting
  - magnitude always less than or equal to magnitude of gradient
- Obtaining Tangent Lines and Tangent Planes from Gradient

IX. **Double Integrals**
- Region of Integration
- Fubini's Thm
- Double Integrals as Volumes

Double Integrals as Areas
Averages, Centroids
Polar Form of Double Intregrals
Transforming Intervals of Integration
from Cartesion to Polar Coordinates
Remembering that $dydx \rightarrow rdrd\theta$

X. **Triple Integrals**

Finding Limits of Integration
Fubini's Thm
Triple Integrals as Volumes
Averages using Triple Integrals
Triple Integrals in Cylindrical Coordinates
Going back and forth between Cylindrical and Rectangular Coords
Going back and forth between Cylindrical and Spherical Coords
Triple Integrals in Spherical Coordinates
Going back and forth between Spherical and Rectangular Coords
Going back and forth between Spherical and Cylindrical Coords

General Info to Bring With You

Taylor expansions for common series: cos(x), sin(x), ln(x), exp(x) etc.
Standard Trig Identities