Pre-calc
Basic functions and basic graphs
   lines (esp. point slope form)
   polynomials, rational functions,
   trigonometric functions
      unit circle, special values, identities (even/odd, Pythagorean, angle addition)
   exponentials, logarithms
Transformations (and using them to sketch)
Inverse functions (definition and graphing them)
Domain/range
Limits
   Calculating basic limits, properties of limits
   Limits at infinity (esp. rational functions, e^x)
   Asymptotes (vertical and horizontal)
   Continuity (definition, removable discontinuities, continuous extensions)

Differentiation
The basics
   Estimates: Average change, Mean Value Theorem
   Limit definition of a derivative
      Instantaneous rate of change
   Calculating derivatives using limits
   Properties of derivatives
   Derivatives of basic functions
   Derivative rules (scaling, sum, chain, product, quotient)
   Higher order derivatives (how, what they mean, notation)
Implicit differentiation
   Definition and how
   Derivatives of inverse functions
      How to simplify things like tan(arcsin(x))
   Related rates
Tangent lines and approximations
   Formula for tangent line
   Linearization
      Higher order: Taylor polynomials
   Newton's method for roots
      Rolle's Theorem
   Euler's method (see differential equations)
Meanings of derivatives
   Physics: position, velocity, acceleration
Graphing
   Critical points and intervals of increase/decrease
   Concavity and inflection points
   First and second derivative tests for finding local maxima and minima
   Optimization problems
**Integration**

**Antiderivatives**
- Meaning
- Scaling and sum rule
- Substitution
- Partial fractions (integrating things like \(1/(y(y-2))\))

**Definite integrals**

**Estimates**
- Rectangles
  - Upper (circumscribed, over-estimate, use max of \(f\) over each interval)
  - Lower (inscribed, under-estimate, use min of \(f\) over each interval)
- Left, Right, Mid
- Summation notation
- Limit definition of the definite integral
- Trapezoids
- Simpson’s rule
- Error

**Properties of the definite integral**
- Symmetries (even and odd functions)
- Reversing endpoints
- Area versus signed area

**Fundamental theorem of calculus**
- I: Evaluating definite integrals using antiderivatives
- II: Function endpoints and derivatives

**Applications**
- Average value
- Mean Value Theorem for integrals
- Arc length
- Area between curves
  - flipping inverse functions

**Differential equations**
- Initial value problems
  - General solution
  - Particular solution
- Separable equations
- Checking solutions to differential equations
- Word problems
  - Growth and decay problems
  - Newton's law of cooling
  - Logistic growth
- Slope fields
- Euler's Method