Please check regularly for updates and try to come prepared for the next class. The topics marked in red are not covered in the textbook and will not be part of the exams.

Week 1

- August 29, 2014
  Sets, open and closed sets, quantifiers, definition of functions, domain, range, algebraic representation and graphs of standard functions: identity function, linear function, polynomial function, exponential function, trigonometric functions.

- September 3, 2014
  Scaling and translations of functions and their graphs, composition of functions with examples, odd and even functions with examples, compositions of odd and even functions

- September 5, 2014
  Composition of piece-wise defined functions, injective functions, invertibility of functions, inverse functions with examples: nth-root functions, logarithmic functions, inverse trigonometric functions and their graphs.

Week 2

- September 8, 2014
  Boundedness of sets, Supremum, Infimum, open (deleted) neighbourhood of points on the real line, limit points, notion of the limit of a function

- September 10, 2014
  Limits of standard functions, limit rules with examples, Sandwich the-
orem (or Squeeze theorem) with examples (geometric proof of $\lim_{x \to 0} \frac{\sin x}{x} = 1$)

• September 12, 2014
  Precise definition of a limit of a function, discussion of divergence of $\lim_{x \to 0} \sin \frac{1}{x}$, continuity of functions with examples, limits of composite functions, properties of continuous functions: sign preserving property, Bolzano’s theorem (Intermediate value theorem), limits of composite functions

**Week 3**

• September 15
  Indefinite limits, asymptotes with examples, derivative of a function, difference quotient, velocity and tangent problem

• September 17
  Slopes of tangents of some curves from first principles, examples of non-existence of a derivative, differentiability implies continuity

• September 19
  Derivative of $x^n$ (also discussed the Binomial Theorem), exponential functions, higher order derivatives, acceleration and jerk, $C^n$ spaces.

**Week 4**

• September 22
  Rules of differentiation: sum and difference, example problems, Leibniz rule with examples, quotient rule

• September 24
  Examples of quotient rule, derivatives of trigonometric functions from first principles, chain rule

• September 26
  Examples of chain rule, implicit differentiation

**Week 5**

• September 29
  Examples of implicit differentiation, derivatives of inverse trigonometric functions,
• October 1
inverse trigonometric functions (contd...), derivatives of logarithmic
functions, logarithmic differentiation, related rates

• October 3
examples of related rates (parametric differentiation), linear approxi-
mations and differentials

Week 6

• October 6
More examples of linear approximations, differentials with examples,
review for midterm

• October 8
In class midterm test

• October 10
Hyperbolic functions, their motivation/similarity with trigonometric
functions, identities and derivatives

Week 7

• October 13
Definitions of inverse hyperbolic functions and their derivatives

• October 15
Applications of derivatives, increasing and decreasing functions, their
derivatives and the shapes of their graphs

• October 16
Definitions of absolute (global), local maximum and minimum with
examples, critical points, Fermat’s theorem, extreme value theorem
for continuous functions

Week 8

• October 20
Review of absolute (global), local maximum and minimum, critical
points with examples, closed interval method for finding global maxi-
num and minimum with examples

• October 22
Rolle’s and Lagrange’s mean value theorems with proofs and applica-
tions
• October 24
Revisit shapes of graphs of functions and their derivatives, characterization of local maximum and minimum, points of inflection (saddle points or mountain pass points)

Week 9

• October 27
  The first derivative test to find maximum and minimum with examples

• October 29
  Concavity of graphs of functions, second derivative test with examples

• October 31
  L’Hospital’s rule with examples - exponential function grows faster than polynomial functions, brief mention of complexity

Week 10

• November 3
  More examples of optimization problems, Antiderivatives of some standard functions

• November 5
  Calculation of higher order antiderivatives with examples, with boundary/initial values

• November 7
  Areas and volumes, Riemann sums, definite integrals

Week 11

• November 10
  Calculation of definite integrals and areas using Riemann sums with examples

• November 12
  In class midterm test

• November 14
  More examples of calculation of definite integrals from first principles, properties of definite integrals
Week 12

- November 17
  The fundamental theorem of calculus and its proof, examples in combination with chain rule

- November 19
  Indefinite integrals, review of antiderivatives, method of substitution

- November 21
  More examples/methods of finding indefinite integrals of functions

Week 13

- November 24 – 28
  Thanksgiving Break

Week 14

- December 1
  Average of a function, arc length, derivation and examples

- December 3
  Areas between the graphs of functions, various scenarios

- December 5
  Polar coordinates, areas and solids of revolution, washers.

Week 15

- December 10, 9 am –12 Noon
  Final examination