

Outline, course : from Stewart-Day

3.1 ~~2~~ 3.6 (exponentials)

week 1 3.2.

3.3 (power law)

3.4 (product rule)

week 2

over

{ 3.2 } again.

3.4 }

3.7 (natural log)

3.5 (chain rule)

3.6 ; 1.4

some 4.5: $X_{n+1} = r X_n$.

week 3

3.5 ctid

3.8 (linear approx.)

3.3 (trig functions)

week 4, 3.8.

midterm Jan 31

week 5.

3.8 again.

4.1, Max & Min. Optimization.

week 6 : 4.2. Qualitative shape of graph. f''
3.2 again.

week 7 : 4.5. Discrete dynamics, or recursion.

2.1

May's paper.

week 8.

May cited.

2.2. limits.

2.3. limits, mas.

week 9

review

misc. ibasta!

week 10

ibasta! for real)

final. ←

2 Limits 89

2.1 Limits of Sequences 90

- The Long-Term Behavior of a Sequence
- Definition of a Limit
- Limit Laws
- Geometric Sequences
- Recursion for Medication
- Geometric Series
- The Logistic Sequence in the Long Run

PROJECT Modeling the Dynamics of Viral Infections 101

2.2 Limits of Functions at Infinity 102

- The Monod Growth Function
- Definition of a Limit at Infinity
- Limits Involving Exponential Functions
- Infinite Limits at Infinity

2.3 Limits of Functions at Finite Numbers 111

- Velocity Is a Limit
- Limits: Numerical and Graphical Methods
- One-Sided Limits
- Infinite Limits

2.4 Limits: Algebraic Methods 125

- The Limit Laws
- Additional Properties of Limits
- Limits of Trigonometric Functions

2.5 Continuity 137

- Definition of a Continuous Function
- Which Functions Are Continuous?
- Approximating Discontinuous Functions by Continuous Ones

Review 149

CASE STUDY 2a Hosts, Parasites, and Time-Travel 151

3 Derivatives 155

3.1 Derivatives and Rates of Change 156

- Measuring the Rate of Increase of Blood Alcohol Concentration
- Tangent Lines
- Derivatives
- Rates of Change

3.2 The Derivative as a Function 168

- Graphing a Derivative from a Function's Graph
- Finding a Derivative from a Function's Formula
- Differentiability
- Higher Derivatives
- What a Derivative Tells Us about a Function

3.3 Basic Differentiation Formulas 181

- Power Functions
- New Derivatives from Old
- Exponential Functions
- Sine and Cosine Functions

3.4 The Product and Quotient Rules 194

- The Product Rule
- The Quotient Rule
- Trigonometric Functions

3.5 The Chain Rule 202

- Combining the Chain Rule with Other Rules
- Exponential Functions with Arbitrary Bases
- Longer Chains
- Implicit Differentiation
- Related Rates
- How To Prove the Chain Rule

- 3.6 Exponential Growth and Decay 215**
 ■ Population Growth ■ Radioactive Decay ■ Newton's Law of Cooling
PROJECT: Controlling Red Blood Cell Loss During Surgery 222
- 3.7 Derivatives of the Logarithmic and Inverse Tangent Functions 222**
 ■ Differentiating Logarithmic Functions ■ Logarithmic Differentiation
 ■ The Number e as a Limit ■ Differentiating the Inverse Tangent Function
- 3.8 Linear Approximations and Taylor Polynomials 230**
 ■ Tangent Line Approximations ■ Newton's Method ■ Taylor Polynomials
PROJECT: Harvesting Renewable Resources 239
- Review 240
- CASE STUDY 1b** Kill Curves and Antibiotic Effectiveness 245

4 Applications of Derivatives 249

- 4.1 Maximum and Minimum Values 250**
 ■ Absolute and Local Extreme Values ■ Fermat's Theorem
 ■ The Closed Interval Method
PROJECT: The Calculus of Rainbows 259
- 4.2 How Derivatives Affect the Shape of a Graph 261**
 ■ The Mean Value Theorem ■ Increasing and Decreasing Functions ■ Concavity
 ■ Graphing with Technology
- 4.3 L'Hospital's Rule: Comparing Rates of Growth 274**
 ■ Indeterminate Quotients ■ Which Functions Grow Fastest?
 ■ Indeterminate Products ■ Indeterminate Differences
PROJECT: Mutation-Selection Balance in Genetic Diseases 284
- 4.4 Optimization Problems 285**
PROJECT: Flapping and Gliding 297
PROJECT: The Tragedy of the Commons: An Introduction to Game Theory 298
- 4.5 Recursions: Equilibria and Stability 299**
 ■ Equilibria ■ Cobwebbing ■ Stability Criterion
- 4.6 Antiderivatives 306**
 Review 312

5 Integrals 315

- 5.1 Areas, Distances, and Pathogenesis 316**
 ■ The Area Problem ■ The Distance Problem ■ Pathogenesis
- 5.2 The Definite Integral 329**