Thinkwell's Homeschool Calculus Course Lesson Plan: 38 weeks

Welcome to Thinkwell's Homeschool Calculus! We're thrilled that you've decided to make us part of your homeschool curriculum. This lesson plan is meant to be a guide for you and your homeschool student. Each day, you'll tackle a different topic and all the materials associated with that topic, such as video lectures, exercises, and notes. If you follow our day-by-day schedule, you'll complete the full curriculum for the course in 38 weeks. Feel free to modify and amend the plan as it best works for you. And, as always, please let us know what we can do to help you get up and running with Thinkwell's Calculus!

Chapter 1: The Basics	
Assignments	Notes
Week 1, Day 1	
1.1.1 An Introduction to Thinkwell's Calculus	
1.1.2 The Two Questions of Calculus	
Week 1, Day 2	
1.1.3 Average Rates of Change	
1.1.4 How to Do Math	
Week 1, Day 3	
1.2.1 Functions	
Week 1, Day 4	
1.2.2 Graphing Lines	
1.2.3 Parabolas	
Week 1, Day 5	
1.2.4 Some Non-Euclidean Geometry	

Week 2	
Chapter 1 test	
Chapter 2: Limits	
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Week 2, Day 1	
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Week 2, Day 2	Chapter 1 Test
Chapter 1 Test	Score:
Week 2, Day 3	
2.1.1 Finding Rate of Change over an Interval	
2.1.2 Finding Limits Graphically	
Week 2, Day 4	
2.1.3 The Formal Definition of a Limit	
2.1.4The Limit Laws, Part I	
Week 2, Day 5	
2.1.5 The Limit Laws, Part II	
2.1.6 One-Sided Limits	

Chapter 2: Limits Chapter 2 Test Assignments Notes Week 3, Day 1 2.1.7 The Squeeze Theorem 2.1.8 Continuity and Discontinuity Week 3, Day 2 2.2.1 Evaluating Limits 2.2.2 Limits and Indeterminate Forms Week 3, Day 3 2.2.3 Two Techniques for Evaluating Limits
Assignments Week 3, Day 1 2.1.7 The Squeeze Theorem 2.1.8 Continuity and Discontinuity Week 3, Day 2 2.2.1 Evaluating Limits 2.2.2 Limits and Indeterminate Forms Week 3, Day 3 2.2.3 Two Techniques for Evaluating Limits
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Week 3, Day 3 2.2.3 Two Techniques for Evaluating Limits
2.2.3 Two Techniques for Evaluating Limits
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2.2.4 An Overview of Limits
Week 3, Day 4
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Week 3, Day 5 Chapter 2 Test
Chapter 2 Test Score:

Week 4	
Chapter 3: An Introduction to Derivatives	
Assignments	Notes
Week 4, Day 1	
3.1.1 Rates of Change, Secants, and Tangents	
3.1.2 Finding Instantaneous Velocity	
Week 4, Day 2	
3.1.3 The Derivative	
3.1.4 Differentiability	
Week 4, Day 3	
3.2.1 The Slope of a Tangent Line	
3.2.2 Instantaneous Rate	
Week 4, Day 4	
3.2.3 The Equation of a Tangent Line	
3.2.4 More on Instantaneous Rate	
Week 4, Day 5	
3.3.1 The Derivative of the Reciprocal Function	
3.3.2 The Derivative of the Square Root Function	

Week 5	
Chapter 3 Test	
Chapter 4: Computational Techniques	
Assignments	Notes
Week 5, Day 1	
Chapter 3 Practice Test	

Week 5, Day 2	Chapter 3 Test
Chapter 3 Test	Score:
Week 5, Day 3	
4.1.1 A Shortcut for Finding Derivatives	
4.1.2 A Quick Proof of the Power Rule	
Week 5, Day 4	
4.1.3 Uses of the Power Rule	
4.2.1 The Product Rule	
Week 5, Day 5	
4.2.2 The Quotient Rule	
4.3.1 An Introduction to the Chain Rule	
4.2.2 The Quotient Rule	

Week 6	
Chapter 4: Computational Techniques	
Chapter 4 Test	
Chapter 5: Special Functions	
Assignments	Notes
Week 6, Day 1	
4.3.2 Using the Chain Rule	
4.3.3 Combining Computational Techniques	
Week 6, Day 2	
Chapter 4 Practice Test	
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Chapter 4 Test	Score:
Week 6, Day 4	
5.1.1 A Review of Trigonometry	
5.1.2 Graphing Trigonometric Functions	
Week 6, Day 5	
5.1.3 The Derivatives of Trigonometric Functions	
5.1.4 The Number Pi	

Week 7	
Chapter 5: Special Functions	
Chapter 5 Test	
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Week 7, Day 1	
5.2.1 Graphing Exponential Functions	
5.2.2 Derivatives of Exponential Functions	
Week 7, Day 2	
5.2.3 The Music of Math	
5.3.1 Evaluating Logarithmic Functions	
Week 7, Day 3	
5.3.2 The Derivative of the Natural Log Function	
5.3.3 Using the Derivative Rules with Transcendental Functions	

Week 7, Day 4	
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Chapter 5 Test	Score:

Week 8	
Chapter 6: Implicit Differentiation	
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Week 8, Day 1	
6.1.1 An Introduction to Implicit Differentiation	
6.1.2 Finding the Derivative Implicitly	
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6.2.1 Using Implicit Differentiation	
Week 8, Day 3	
6.2.2 Applying Implicit Differentiation	
Week 8, Day 4	
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Chapter 6 Test	Score:

Week 9	
Chapter 7: Applications of Differentiation	
Assignments	Notes
Week 9, Day 1	
7.1.1 Acceleration and the Derivative	
7.1.2 Solving Word Problems Involving Distance and Velocity	
Week 9, Day 2	
7.2.1 Higher-Order Derivatives and Linear Approximation	
7.2.2 Using the Tangent Line Approximation Formula	
Week 9, Day 3	
7.2.3 Newton's Method	
7.3.1 The Connection Between Slope and Optimization	
Week 9, Day 4	
7.3.2 The Fence Problem	
7.3.3 The Box Problem	
Week 9, Day 5	
7.3.4 The Can Problem	
7.3.5 The Wire-Cutting Problem	

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7.4.1 The Pebble Problem	
7.4.2 The Ladder Problem	
Week 10, Day 2	
7.4.3 The Baseball Problem	
Week 10, Day 3	
7.4.4 The Blimp Problem	
7.4.5 Math Anxiety	
Week 10, Day 4	
Chapter 7 Practice Test	
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Chapter 7 Test	Score:
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Chapter 8: Curve Sketching	
Assignments	Notes
Week 11, Day 1	
8.1.1 An Introduction to Curve Sketching	
8.1.2 Three Big Theorems	
Week 11, Day 2	
8.1.3 Morale Moment	
8.2.1 Critical Points	
Week 11, Day 3	
8.2.2 Maximum and Minimum	
8.2.3 Regions Where a Function Increases or Decreases	
Week 11, Day 4	
8.2.4 The First Derivative Test	
8.2.5 Math Magic	
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8.3.1 Concavity and Inflection Points	
8.3.2 Using the Second Derivative to Examine Concavity	

Week 12	
Chapter 8: Curve Sketching	
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8.3.3 The Möbius Band	
8.4.1 Graphs of Polynomial Functions	
Week 12, Day 2	
8.4.2 Cusp Points and the Derivative	
8.4.3 Domain-Restricted Functions and the Derivative	

Week 12, Day 3	
8.4.4 The Second Derivative Test	
8.5.1 Vertical Asymptotes	
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8.5.2 Horizontal Asymptotes and Infinite Limits	
8.5.3 Graphing Functions with Asymptotes	
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8.5.4 Functions with Asymptotes and Holes	
8.5.5 Functions with Asymptotes and Critical Points	

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Chapter 8 Test	
Chapter 9: The Basics of Integration	
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Chapter 8 Practice Test	
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Week 13, Day 3	
9.1.1 Antidifferentiation	
9.1.2 Antiderivatives of Powers of <i>x</i>	
Week 13, Day 4	
9.1.3 Antiderivatives of Trigonometric and Exponential Functions	
9.2.1 Undoing the Chain Rule	
Week 13, Day 5	
9.2.2 Integrating Polynomials by Substitution	
9.3.1 Integrating Composite Trigonometric Functions by Substitution	

Week 14	
Chapter 9: The Basics of Integration	
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9.3.2 Integrating Composite Exponential and Rational Functions by	
Substitution	
9.3.3 More Integrating Trigonometric Functions by Substitution	
Week 14, Day 2	
9.3.4 Choosing Effective Function Decompositions	
9.4.1 Approximating Areas of Plane Regions	
Week 14, Day 3	
9.4.2 Areas, Riemann Sums, and Definite Integrals	
9.4.3 The Fundamental Theorem of Calculus, Part I	
Week 14, Day 4	
9.4.4 The Fundamental Theorem of Calculus, Part II	
9.4.5 Illustrating the Fundamental Theorem of Calculus	

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9.4.6 Evaluating Definite Integrals	

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Chapter 10: Applications of Integration	
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10.1.2 Gravity and Vertical Motion	
Week 15, Day 4	
10.1.3 Solving Vertical Motion Problems	
10.2.1 The Area between Two Curves	
Week 15, Day 5	
10.2.2 Limits of Integration and Area	
10.2.3 Common Mistakes to Avoid When Finding Areas	

Week 16	
Chapter 10: Applications of Integration	
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Chapter 11: Calculus I Review	
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Week 16, Day 1	
10.2.4 Regions Bound by Several Curves	
10.3.1 Finding Areas by Integrating with Respect to y: Part One	
Week 16, Day 2	
10.3.2 Finding Areas by Integrating with Respect to y: Part Two	
10.3.3 Area, Integration by Substitution, and Trigonometry	
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Chapter 10 Test	Test Score:
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11.1.1 A Glimpse Into Calculus II	

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Chapter 12: Math Fun	
Midterm Exam	
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12.1.1 An Introduction to Paradoxes	
12.1.2 Paradoxes and Air Safety	
12.1.3 Newcomb's Paradox	
Week 17, Day 2	
12.1.4 Zeno's Paradox	
12.2.1 Fibonacci Numbers	
12.2.2 The Golden Ratio	
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Study for Midterm Exam	
Week 17, Day 4	
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13.1.2 Review: Calculus I in 20 Minutes	
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14.1.1 Indeterminate Forms	
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14.1.2 An Introduction to L'Hôpital's Rule	
Week 18, Day 4	
14.1.3 Basic Uses of L'Hôpital's Rule	
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14.1.4 More Exotic Examples of Indeterminate Forms	
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14.2.1 L'Hôpital's Rule and Indeterminate Products	
Week 19, Day 2	
14.2.2 L'Hôpital's Rule and Indeterminate Differences	
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14.2.3 L'Hônital's Rule and One to the Infinite Power	i

14.2.4 Another Example of One to the Infinite Power	
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15.1.2 Differentiating Logarithmic Functions	
Week 20, Day 2	
15.1.3 Logarithmic Differentiation	
15.1.4 The Basics of Inverse Functions	
Week 20, Day 3	
15.1.5 Finding the Inverse of a Function	
15.2.1 Derivatives of Inverse Functions	
Week 20, Day 4	
15.3.1 The Inverse Sine, Cosine, and Tangent Functions	
15.3.2 The Inverse Secant, Cosecant, and Cotangent Functions	
Week 20, Day 5	
15.3.3 Evaluating Inverse Trigonometric Functions	

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Week 21	
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15.4.1 Derivatives of Inverse Trigonometric Functions	
15.4.2 More Calculus of Inverse Trigonometric Functions	
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15.5.1 Defining the Hyperbolic Functions	
15.5.2 Hyperbolic Identities	
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15.5.3 Derivatives of Hyperbolic Functions	
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16.1.2 Making u-Substitutions	
Week 22, Day 2	
16.2.1 An Introduction to Integrals with Powers of Sine and Cosine	
16.2.2 Integrals with Powers of Sine and Cosine	
Week 22, Day 3	
16.2.3 Integrals with Even and Odd Powers of Sine and Cosine	
16.3.1 Integrals of Other Trigonometric Functions	
Week 22, Day 4	
16.3.2 Integrals with Odd Powers of Tangent and Any Power of Secant	
16.3.3 Integrals with Even Powers of Secant and Any Power of Tangent	
Week 22, Day 5	
16.4.1 Finding Partial Fraction Decompositions	
16.4.2 Partial Fraction	
16.4.3 Long Division	

Week 23	
Chapter 16: Techniques of Integration	
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Week 23, Day 1	
16.5.1 Repeated Linear Factors: Part One	
16.5.2 Repeated Linear Factors: Part Two	
Week 23, Day 2	
16.5.3 Distinct and Repeated Quadratic Factors	
16.5.4 Partial Fractions of Transcendental Functions	
Week 23, Day 3	
16.6.1 An Introduction to Integration by Parts	
16.6.2 Applying Integration by Parts to the Natural Log Function	
Week 23, Day 4	
16.6.3 Inspirational Examples of Integration by Parts	
16.6.4 Repeated Application of Integration by Parts	
Week 23, Day 5	
16.6.5 Algebraic Manipulation and Integration by Parts	
16.7.1 Converting Radicals into Trigonometric Expressions	

Week 24	
Chapter 16: Techniques of Integration	
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16.7.2 Using Trigonometric Substitution to Integrate Radicals	
16.7.3 Trigonometric Substitutions on Rational Powers	
Week 24, Day 2	
16.8.1 An Overview of Trigonometric Substitution Strategy	
16.8.2 Trigonometric Substitution Involving a Definite Integral: Part One	
16.8.3 Trigonometric Substitution Involving a Definite Integral: Part Two	
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16.9.1 Deriving the Trapezoidal Rule	
16.9.2 An Example of the Trapezoidal Rule	
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Week 25	
Chapter 17: Improper Integrals	
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17.1.1 The First Type of Improper Integral	
Week 25, Day 2	
17.1.2 The Second Type of Improper Integral	
Week 25, Day 3	
17.1.3 Infinite Limits of Integration, Convergence, and Divergence	
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Chapter 18: Applications of Integral Calculus	
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18.2.1 Finding Volumes Using Cross-Sectional Slices	
Week 26, Day 2	
18.2.2 An Example of Finding Cross-Sectional Volumes	
18.3.1 Solids of Revolution	
Week 26, Day 3	
18.3.2 The Disk Method along the y-Axis	
18.3.3 A Transcendental Example of the Disk Method	

Week 26, Day 4	
18.3.4 The Washer Method across the x-Axis	
18.3.5 The Washer Method across the y-Axis	
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18.4.1 Introducing the Shell Method	
18.4.2 Why Shells Can Be Better Than Washers	

Week 27	
Chapter 18: Applications of Integral Calculus	
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18.4.3 The Shell Method: Integrating with Respect to y	
18.5.1 An Introduction to Arc Length	
Week 27, Day 2	
18.5.2 Finding Arc Lengths of Curves Given by Functions	
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18.6.1 An Introduction to Work	
18.6.2 Calculating Work	
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18.6.3 Hooke's Law	
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18.7.1 Center of Mass	
18.7.2 The Center of Mass of a Thin Plate	

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19.1.2 Determining the Limit of a Sequence	
Week 28, Day 4	
19.1.3 The Squeeze and Absolute Value Theorems	
19.2.1 Monotonic and Bounded Sequences	
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19.3.1 An Introduction to Infinite Series	
19.3.2 The Summation of Infinite Series	
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19.3.4 Telescoping Series
Week 29, Day 2
19.4.1 Properties of Convergent Series
19.4.2 The nth-Term Test for Divergence
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19.5.1 An Introduction to the Integral Test
19.5.2 Examples of the Integral Test
Week 29, Day 4
19.5.3 Using the Integral Test
19.5.4 Defining p-Series
Week 29, Day 5
19.6.1 An Introduction to the Direct Comparison Test
19.6.2 Using the Direct Comparison Test

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19.7.1 An Introduction to the Limit Comparison Test	
19.7.2 Using the Limit Comparison Test	
Week 30, Day 2	
19.7.3 Inverting the Series in the Limit Comparison Test	
19.8.1 Alternating Series	
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19.8.2 The Alternating Series Test	
19.8.3 Estimating the Sum of an Alternating Series	
Week 30, Day 4	
19.9.1 Absolute and Conditional Convergence	
19.10.1 The Ratio Test	
Week 30, Day 5	
19.10.2 Examples of the Ratio Test	
19.10.3 The Root Test	

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Week 31, Day 1	
19.11.1 Polynomial Approximation of Elementary Functions	
19.11.2 Higher-Degree Approximations	
Week 31, Day 2	
19.12.1 Taylor Polynomials	
19.12.2 Maclaurin Polynomials	

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19.12.3 The Remainder of a Taylor Polynomial	
19.12.4 Approximating the Value of a Function	
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19.13.1 Taylor Series	
19.13.2 Examples of the Taylor and Maclaurin Series	
Week 31, Day 5	
19.13.3 New Taylor Series	
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Chapter 19: Sequences and Series	
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19.14.2 The Interval and Radius of Convergence	
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19.14.3 Finding the Interval and Radius of Convergence: Part One	
19.14.4 Finding the Interval and Radius of Convergence: Part Two	
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19.14.5 Finding the Interval and Radius of Convergence: Part Three	
19.15.1 Differentiation and Integration of Power Series	
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19.15.2 Finding Power Series Representations by Differentiation	
19.15.3 Finding Power Series Representations by Integration	
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19.15.4 Integrating Functions Using Power Series	

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20.1.1 An Introduction to Differential Equations	
20.1.2 Solving Separable Differential Equations	
Week 33, Day 4	
20.1.3 Finding a Particular Solution	
20.1.4 Direction Fields	

Week 33, Day 5	
20.1.5 Euler's Method for Solving Differential Equations Numerically	
20.2.1 Separating Homogeneous Differential Equations	

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Week 34, Day 1	
20.2.2 Change of Variables	
20.3.1 Exponential Growth	
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20.3.2 Logistic Growth	
20.3.3 Radioactive Decay	
Week 34, Day 3	
20.4.1 First-Order Linear Differential Equations	
20.4.2 Using Integrating Factors	
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Week 35, Day 1	
21.1.1 An Introduction to Parametric Equations	
21.1.2 The Cycloid	
21.1.3 Eliminating Parameters	
Week 35, Day 2	
21.2.1 Derivatives of Parametric Equations	
21.2.2 Graphing the Elliptic Curve	
Week 35, Day 3	
21.2.3 The Arc Length of a Parameterized Curve	
21.2.4 Finding Arc Lengths of Curves Given by Parametric Equations	
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21.3.1 The Polar Coordinate System	
21.3.2 Converting between Polar and Cartesian Forms	
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21.3.3 Spirals and Circles	
21.3.4 Graphing Some Special Polar Functions	

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21.4.2 Finding the Slopes of Tangent Lines in Polar Form	
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21.5.1 Heading toward the Area of a Polar Region	
21.5.2 Finding the Area of a Polar Region: Part One	
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21.5.4 The Area of a Region Bounded by Two Polar Curves: Part One	
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22.1.2 Introduction to Vectors	
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22.1.3 Vectors in R ² and R ³	
22.1.4 An Introduction to the Dot Product	
22.1.5 Orthogonal Projections	
Week 37, Day 3	
22.1.6 An Introduction to the Cross Product	
22.1.7 Geometry of the Cross Product	
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22.1.8 Equations of Lines and Planes in R ³	
22.2.1 Introduction to Vector Functions	
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22.2.2 Derivatives of Vector Functions	
22.2.3 Vector Functions: Smooth Curves	
22.2.4 Vector Functions: Velocity and Acceleration	

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Practice Final Exam	
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Final Exam	Score: