

## Curriculum Guide Calculus

### Unit 1: Functions and Models

Biblical Worldview Essential Questions:  
What models of faith did God give in the Bible?

6 Lessons (1 week)

C#1

Objectives	Methods	Resources	Assessment
The students will <ol style="list-style-type: none"><li>review basic ideas concerning functions.</li><li>graph, transform and combine functions.</li><li>represent functions in four ways: by an equation, in a table, by a graph, or in words.</li><li>solve problems involving the main types of functions that occur in calculus.</li><li>use functions as mathematical models of real-world phenomena.</li><li>graph functions using graphing calculators.</li><li>understand limitations of graphing calculators.</li></ol>	<ul style="list-style-type: none"><li>teacher lecture</li><li>teacher working examples on the board</li><li>related YouTube videos</li><li>student guided practice of problems in book</li><li>cooperative learning groups</li><li>individual assistance</li><li>partner work</li><li>homework</li></ul>	<ul style="list-style-type: none"><li>Calculus: Graphical, Numerical, Algebraic, 4<sup>th</sup> Ed., Ross L. Finney . . . [et al.]; Pearson Education, 2012</li></ul>	<ul style="list-style-type: none"><li>check homework</li><li>Quizzes</li><li>Tests</li><li>Oral response</li><li>Board work</li></ul>

## *Curriculum Guide Calculus*

### **Unit 2: Limits and Rates of Change**

Biblical Worldview Essential Questions:  
**What limitations did God put on mankind?**

**13 Lessons (3 weeks)**

**C#1**

<b>Objectives</b>	<b>Methods</b>	<b>Resources</b>	<b>Assessment</b>
<p>The students will</p> <ol style="list-style-type: none"> <li>1. understand historical development of limits from the tangent problem and the velocity problem</li> <li>2. develop “intuitive feel” for limits.</li> <li>3. use algebraic techniques for computing limits of functions.</li> <li>4. use algebraic techniques for computing limits at infinity.</li> <li>5. understand and use precise definition of limits.</li> <li>6. calculate limits using limit laws</li> <li>7. understand and use formal definition of continuity.</li> <li>8. investigate average and instantaneous rates of change and how they relate to limits.</li> </ol>	<ul style="list-style-type: none"> <li>• teacher lecture</li> <li>• teacher working examples on the board</li> <li>• related YouTube videos</li> <li>• student guided practice of problems in book</li> <li>• cooperative learning groups</li> <li>• individual assistance</li> <li>• partner work</li> <li>• homework</li> </ul>	<ul style="list-style-type: none"> <li>• Calculus: Graphical, Numerical, Algebraic, 4<sup>th</sup> Ed., Ross L. Finney . . . [et al.]; Pearson Education, 2012</li> </ul>	<ul style="list-style-type: none"> <li>• check homework</li> <li>• Quizzes</li> <li>• Tests</li> <li>• Oral response</li> <li>• Board work</li> </ul>

*Curriculum Guide Calculus*

**Unit 3: The Derivative**

Biblical Worldview Essential Questions:  
 What are examples of instantaneous changes in the Bible?

**27 Lessons**

**C#2, C#3**

<b>Objectives</b>	<b>Methods</b>	<b>Resources</b>	<b>Assessment</b>
The students will <ol style="list-style-type: none"> <li>1. investigate relationship between the slope of a curve at a point and the rate of change.</li> <li>2. develop concept of derivative and relate it to rates of change and slopes of curves.</li> <li>3. develop concept of the derivative as a function</li> <li>4. determine when a function is not differentiable</li> <li>5. use special techniques to find derivatives of functions.</li> <li>6. apply derivatives to rates of change problems in the natural and social sciences</li> <li>7. memorize and use formulas for derivatives of trigonometric functions.</li> <li>8. find derivatives of composition of functions by using the chain rule.</li> <li>9. perform implicit differentiation.</li> <li>10. find higher order derivatives</li> <li>11. solve related rate problems.</li> <li>12. understand and use differentials to perform local linear approximation.</li> </ol>	<ul style="list-style-type: none"> <li>• teacher lecture</li> <li>• teacher working examples on the board</li> <li>• related YouTube videos</li> <li>• student guided practice of problems in book</li> <li>• cooperative learning groups</li> <li>• individual assistance</li> <li>• partner work</li> <li>• homework</li> </ul>	<ul style="list-style-type: none"> <li>• Calculus: Graphical, Numerical, Algebraic, 4<sup>th</sup> Ed., Ross L. Finney . . . [et al.]; Pearson Education, 2012</li> </ul>	<ul style="list-style-type: none"> <li>• check homework</li> <li>• Quizzes</li> <li>• Tests</li> <li>• Oral response</li> <li>• Board work</li> </ul>

*Curriculum Guide Calculus*

**Unit 4: The Derivative in Graphing and Applications**

Biblical Worldview Essential Questions:

**A practical use of derivatives is for optimization.**

**How does the Bible tell us to optimize our Christian life?**

**20 Lessons**

**C#3, C#4**

<b>Objectives</b>	<b>Methods</b>	<b>Resources</b>	<b>Assessment</b>
<p>The students will</p> <ol style="list-style-type: none"> <li>1. use the first derivative to determine where a function is increasing or decreasing.</li> <li>2. find absolute extrema values on open and closed intervals.</li> <li>3. understand and use Rolle's Theorem and the Mean-Value Theorem.</li> <li>4. use the second derivative to determine where a function is concave up or concave down.</li> <li>5. use the first and second derivative tests to determine where relative extrema and inflection points occur on the graph of a function.</li> <li>6. use derivatives and previously learned properties of functions to completely analyze the graph of a function.</li> <li>7. use derivatives to analyze rectilinear motion.</li> <li>8. solve optimization problems.</li> <li>9. find the antiderivative of a function</li> <li>10. use a direction field to find the specific solution of a differential equation</li> </ol>	<ul style="list-style-type: none"> <li>• teacher lecture</li> <li>• teacher working examples on the board</li> <li>• related YouTube videos</li> <li>• student guided practice of problems in book</li> <li>• cooperative learning groups</li> <li>• individual assistance</li> <li>• partner work</li> <li>• homework</li> </ul>	<ul style="list-style-type: none"> <li>• Calculus: Graphical, Numerical, Algebraic, 4<sup>th</sup> Ed., Ross L. Finney . . . [et al.]; Pearson Education, 2012</li> </ul>	<ul style="list-style-type: none"> <li>• check homework</li> <li>• Quizzes</li> <li>• Tests</li> <li>• Oral response</li> <li>• Board work</li> </ul>

## Curriculum Guide Calculus

### Unit 5: Integrals

Biblical Worldview Essential Questions:  
 A technique of integration is to use substitution.  
**Where do we see substitution in the Bible?**

20 Lessons (2.5 weeks)

C#4

Objectives	Methods	Resources	Assessment
The students will <ol style="list-style-type: none"> <li>1. understand historical development of integrals from area and distance problems</li> <li>2. use the rectangle method for finding area between the graph of a function and the x-axis.</li> <li>3. find area under the curve using the limit of the summation of areas of rectangles.</li> <li>4. define and associate the definite integral as the limit of Riemann sums.</li> <li>5. use properties of definite integrals</li> <li>6. use the antiderivative method for finding area between the graph of a function and the x-axis.</li> <li>7. use the Fundamental Theorem of Calculus to evaluate definite integrals.</li> <li>8. relate antiderivative to the indefinite integral and memorize basic integration formulas</li> <li>9. use properties of indefinite integrals and the net change theorem to solve problems.</li> <li>10. perform integration using the substitution technique.</li> <li>11. evaluate definite integrals using the substitution method.</li> </ol>	<ul style="list-style-type: none"> <li>• teacher lecture</li> <li>• teacher working examples on the board</li> <li>• related YouTube videos</li> <li>• student guided practice of problems in book</li> <li>• cooperative learning groups</li> <li>• individual assistance</li> <li>• partner work</li> <li>• homework</li> </ul>	<ul style="list-style-type: none"> <li>• Calculus: Graphical, Numerical, Algebraic, 4<sup>th</sup> Ed., Ross L. Finney . . . [et al.]; Pearson Education, 2012</li> </ul>	<ul style="list-style-type: none"> <li>• check homework</li> <li>• Quizzes</li> <li>• Tests</li> <li>• Oral response</li> <li>• Board work</li> </ul>