

Curriculum Guide Precalculus

Prerequisite Chapter

Biblical Worldview Essential Questions:

**If God is just, why are there gross inequalities among mankind?
Why are there exuberantly rich people and devastatingly poor people?**

**Rational expressions mean a ratio of polynomial expressions. Another meaning of rational is “based on facts or reason.”
Is it rational to believe in the God of the Bible?**

12 Days

PC#4

| Objectives | Methods | Resources | Assessment |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The students will 1. Convert between decimals and fractions, write inequalities, apply the basic properties of algebra, and work with exponents and scientific notation. 2. Be able to graph points, find distances and midpoints on a number line and in a coordinate plane, and write standard form equations of circles. 3. Be able to solve linear equations and inequalities in one variable 4. Be able to use the concepts of slope and y-intercept to graph and write linear equations in two variables. 5. Be able to solve equations involving quadratic, absolute value, and fractional expressions by finding x-intercepts or intersections on graphs, by using algebraic techniques, or by using numerical techniques. 6. Be able to add, subtract, multiple, and divide complex numbers; and find complex zeros of quadratic functions. 7. Be able to solve inequalities involving absolute value, quadratic polynomials, and expressions involving fractions. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 1: Functions and Graphs

Biblical Worldview Essential Questions:

What are some biblical guidelines for solving problems we encounter in our everyday lives?

20 Days

PC#4, PC#5

| Objectives | Methods | Resources | Assessment |
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| <p>The students will</p> <ol style="list-style-type: none">1. Be able to use numerical, algebraic, and graphical models to solve problems and will be able to translate from one model to another.2. Be able to represent functions numerically, algebraically, and graphically; determine the domain and range for functions; and analyze function characteristics such as extreme values, symmetry, asymptotes, and end behavior.3. Be able to recognize graphs of twelve basic functions, determine domains of functions related to the twelve basic functions, and combine the twelve basic functions in various ways to create a new function.4. Be able to build new functions from basic functions by adding, subtracting, multiplying, dividing, and composing functions.5. Be able to define functions and relations parametrically and will be able to find inverses of functions and relations.6. Be able to algebraically and graphically represent translations, reflections, stretches, and shrinks of functions and parametric relations.7. Be able to identify appropriate basic functions with which to model real-world problems and be able to produce specific functions to model data, formulas, graphs, and verbal descriptions. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | <p>Precalculus: graphical, numerical, algebraic 8th ed, Pearson education, 2011</p> | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 2: Polynomial, Power, and Rational Functions

Biblical Worldview Essential Questions:

A rectangular coordinate system allows one to locate any point with respect to the origin or to another point.
How does the Bible provide a frame of reference for our own personal Christian life, with respect to God and with respect to other people?

20 Days

PC#2, PC#4

| Objectives | Methods | Resources | Assessment |
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| <p>The students will</p> <ol style="list-style-type: none"> 1. Be able to recognize and graph linear and quadratic functions, and use these functions to model situations and solve problems. 2. Be able to sketch power functions in the form of $f(x) = kx^a$ (where k and a are rational numbers). 3. Be able to graph polynomial functions, predict their end behavior, and find their real zeros using a grapher or an algebraic method 4. Be able to divide polynomials using long division or synthetic division; to apply the Remainder Theorem, Factor Theorem, and Rational Zeros Theorem; and to find upper and lower bounds for zeros of polynomials. 5. Be able to factor polynomials with real coefficients using factors with complex coefficients. 6. Be able to describe the graphs of rational functions, identify horizontal and vertical asymptotes, and predict the end behavior of rational functions. 7. Be able to solve equations involving fractions using both algebraic and graphical techniques and to identify extraneous solutions. 8. Be able to solve inequalities involving polynomials and rational functions by using both algebraic and graphical techniques. | <ul style="list-style-type: none"> ● flipped classroom ● teacher lecture ● teacher working examples on the board ● student guided practice of problems in book ● individual assistance ● partner work ● homework | <p>Precalculus: graphical, numerical, algebraic 8th ed, Pearson education, 2011</p> | <ul style="list-style-type: none"> ● Guided Practice ● Oral Response ● Board work ● Homework ● Quizzes ● Tests |

Curriculum Guide Precalculus

Chapter 3: Exponential, Logistic, and Logarithmic Functions

Biblical Worldview Essential Questions:

Christians should look for ways to grow in their walk with Christ.

Is your walk with God growing exponentially?

Why did the lifespans of the patriarchs from Noah to Joseph decrease exponentially?

12 Days

PC#1, PC#4

| Objectives | Methods | Resources | Assessment |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The students will</p> <ol style="list-style-type: none"> 1. Be able to evaluate exponential expressions and identify and graph exponential and logistic functions 2. Be able to use exponential growth, decay, and regression to model real-life problems. 3. Be able to convert equations between logarithmic form and exponential form, evaluate common and natural logarithms, and graph common and natural logarithmic functions. 4. Be able to apply the properties of logarithms to evaluate expressions and graph functions, and be able to re-express data. 5. Be able to apply the properties of logarithms to solve exponential and logarithmic equations algebraically and solve application problems using these questions. 6. Be able to use exponential functions and equations to solve business and finance applications related to compound interest and annuities. <p>reflections about the x-axis or y-axis.</p> | <ul style="list-style-type: none"> ● flipped classroom ● teacher lecture ● teacher working examples on the board ● student guided practice of problems in book ● individual assistance ● partner work ● homework | <p>Precalculus: graphical, numerical, algebraic 8th ed, Pearson education, 2011</p> | <ul style="list-style-type: none"> ● Guided Practice ● Oral Response ● Board work ● Homework ● Quizzes ● Tests |

Curriculum Guide Precalculus

Chapter 4: Trigonometric Functions

Biblical Worldview Essential Questions:

What did God create or establish that are periodic in nature? (i.e. they recur repetitively and regularly)

Word problems or “story” problems are important for applying math concepts to the real world.

Why did Jesus tell “stories” or parables as a regular part of His teaching?

12 Days

PC#3, PC#4

| Objectives | Methods | Resources | Assessment |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The students will 1. Be able to convert between radians and degrees, find arc lengths, convert to nautical miles, and solve problems involving angular speed. 2. Be able to define the six trigonometric functions using the lengths of the sides of a right triangle. 3. Be able to solve problems involving the trigonometric functions of real numbers and the properties of sine and cosine as periodic functions. 4. Be able to generate the graphs of the sine and cosine functions and explore various transformations of these graphs. 5. Be able to graph parent functions of all six trigonometric functions. 6. Be able to relate the concept of inverse functions to trigonometric functions. 7. Be able to apply the concepts of trigonometry to solve real-world problems. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 5: Analytic Trigonometry

Biblical Worldview Essential Questions:

Our identity should be found in Christ.

How are we impacting the lives of others for eternity?

15 Days

PC#1, PC#4, PC#5

| Objectives | Methods | Resources | Assessment |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The students will</p> <ol style="list-style-type: none">1. Be able to use the fundamental identities to simplify trigonometric expressions and solve trigonometric equations.2. Be able to decide whether an equation is an identity and to confirm identities analytically3. Be able to apply the identities for the cosine, sine, and tangent of a difference or sum.4. Be able to apply the double-angle identities, power-reducing identities, and half-angle identities.5. Be able to understand the proof of the Law of Sines and use the computational applications of the Law of Sines to solve a variety of problems.6. Be able to apply the Law of Cosines to solve acute and obtuse triangles and to determine the area of a triangle in terms of the measures of the sides and angles. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | <p>Precalculus: graphical, numerical, algebraic 8th ed, Pearson education, 2011</p> | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 6: Applications of Trigonometry (optional)

Biblical Worldview Essential Questions:

Vector quantities have magnitude and direction.

What's the magnitude and direction of your Christian walk?

15 Days

PC#1, PC#6

| Objectives | Methods | Resources | Assessment |
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| The students will 1. Be able to apply the arithmetic vectors and use vectors to solve real-world problems 2. Be able to calculate dot products and projections of vectors 3. Be able to define parametric equations, graph curves parametrically, and solve application problems using parametric equations 4. Be able to convert points and equations from polar to rectangular coordinates and vice versa 5. Be able to graph polar equations and determine the maximum r-value and the symmetry of a graph 6. Be able to represent complex numbers in the complex plane and write them in trigonometric form. They will be able to use trigonometric functions to simplify some algebraic operations with complex numbers. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 7: Systems and Matrices

Biblical Worldview Essential Questions:

When making a decision, one should seek what the Bible has to say about it.

Are you looking to God's word when making your decisions?

7 Days

PC#6

| Objectives | Methods | Resources | Assessment |
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| The students will 1. Be able to solve systems of equations graphically and algebraically 2. Be able to find sums, differences, products, and inverses of matrices. 3. Be able to solve systems of linear equations using Gaussian elimination, the reduced row echelon form of a matrix, or an inverse matrix. 4. Be able to decompose rational expressions into partial fractions. 5. Be able to solve linear programming problems and systems of inequalities using graphical methods. | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 8: Analytic Geometry in Two and Three Dimensions (optional)

Biblical Worldview Essential Questions:

A parabola has a focus, in which rays parallel to the axis of symmetry would reflect off the curve and head towards.
What should be the focus of our Christian life and how do we stay on course?

14 Days

PC#1, PC#6

| Objectives | Methods | Resources | Assessment |
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| The students will 1. Be able to find the equation, focus, and directrix of a parabola 2. Be able to find the equation, vertices, and foci of an ellipse 3. Be able to find the equation, vertices, and foci of a hyperbola 4. Be able to determine equations for translated and rotated axes for conic sections 5. Understand the general focus-directrix definition of a conic section and will be able to write equations of conic sections in polar form 6. Be able to draw three-dimensional figures and analyze vectors in space | <ul style="list-style-type: none">● flipped classroom● teacher lecture● teacher working examples on the board● student guided practice of problems in book● individual assistance● partner work● homework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">● Guided Practice● Oral Response● Board work● Homework● Quizzes● Tests |

Curriculum Guide Precalculus

Chapter 9: Discrete Mathematics (optional)

Biblical Worldview Essential Questions:

The golden ratio reflects God's divine creation.

Where do we see the golden ratio in nature?

12 Days

PC#7

| Objectives | Methods | Resources | Assessment |
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| <p>The students will</p> <ol style="list-style-type: none"> 1. Be able to use the multiplication principle of counting, permutations, or combinations to count the number of ways that a task can be done 2. Be able to expand a power of a binomial using the Binomial Theorem or Pascal's triangle. They will also find the coefficient of a given term of a binomial expansion 3. Students will be able to identify a sample space and calculate probabilities and conditional probabilities in sample spaces with equally likely or unequally likely outcomes. 4. Be able to express arithmetic and geometric sequences explicitly and recursively; they will also be able to find limits of convergent sequences 5. Be able to use sigma notation and find finite sums of terms in arithmetic and geometric sequences; they will also be able to find sums of convergent geometric series 6. Be able to use the principle of mathematical induction to prove mathematical generalizations 7. Be able to distinguish between categorical and quantitative variables and use various kinds of graphs to display data 8. Be able to use measures of center, the five-number summary, a box-plot, standard deviation, and normal distribution to describe quantitative data. | <ul style="list-style-type: none"> ● flipped classroom ● teacher lecture ● teacher working examples on the board ● student guided practice of problems in book ● individual assistance ● partner work ● homework | <p>Precalculus: graphical, numerical, algebraic 8th ed, Pearson education, 2011</p> | <ul style="list-style-type: none"> ● Guided Practice ● Oral Response ● Board work ● Homework ● Quizzes ● Tests |

Curriculum Guide Precalculus

Chapter 10: An Introduction to Calculus: Limits, Derivatives, and Integrals (optional)

Biblical Worldview Essential Questions:

Christians must recognize the God is the author of infinity.
What limits do people have on their lives? (Ps. 90:10)

10 Days

PC#8

| Objectives | Methods | Resources | Assessment |
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| The students will 1. Be able to calculate instantaneous velocities and derivatives using limits. 2. Be able to calculate definite integrals using area. 3. Be able to use the properties of limits and evaluate one-sided limits, two-sided limits, and limits involving infinity. 4. Be able to estimate derivatives and integrals using numerical techniques. | <ul style="list-style-type: none">flipped classroomteacher lectureteacher working examples on the boardstudent guided practice of problems in bookindividual assistancepartner workhomework | Precalculus: graphical, numerical, algebraic 8 th ed, Pearson education, 2011 | <ul style="list-style-type: none">Guided PracticeOral ResponseBoard workHomeworkQuizzesTests |