Precalculus

Time on Task: 4.5 hours per week

Course Philosophy

Mathematics demonstrates God's order even in an abstract world, gradually building a base of knowledge and skills beginning with the simplest concepts to the more complex. In mathematics, the student will see the order and truth that God created. Just as the Bible says, "precept upon precept, line upon line…." (Isaiah 23:10) The sequential mastery of mathematical concepts is the primary objective.

Course Description

In Precalculus, students continue to build on the K-8, Algebra I, Algebra II, and Geometry foundations as they expand their understanding through other mathematical experiences. Students use symbolic reasoning and analytical methods to represent mathematical situations, to express generalizations, and to study mathematical concepts and the relationships among them. Students use functions, equations, and limits as useful tools for expressing generalizations and as means for analyzing and understanding a broad variety of mathematical relationships. Students also use functions as well as symbolic reasoning to represent and connect ideas in geometry, probability, statistics, trigonometry, and calculus and to model physical situations. Students use a variety of representations (concrete, pictorial, numerical, symbolic, graphical, and verbal), tools, and technology (including, but not limited to, calculators with graphing capabilities, data collection devices, and computers) to model functions and equations and solve real-life problems.

Goals and Objectives
Texas Essential Knowledge and Skills (TEKS)

§111.35. Precalculus (One-Half to One Credit).

(a) General requirements. The provisions of this section shall be implemented beginning September 1, 1998, and at that time shall supersede §75.63(bb) of this title (relating to Mathematics). Students can be awarded one-half to one credit for successful completion of this course. Recommended prerequisites: Algebra II, Geometry.

(b) Introduction.

(1) In Precalculus, students continue to build on the K-8, Algebra I, Algebra II, and Geometry foundations as they expand their understanding through other mathematical experiences. Students use symbolic reasoning and analytical methods to represent mathematical situations, to express generalizations, and to study mathematical concepts and the relationships among them. Students use functions, equations, and limits as useful tools for

Scope and Sequence

Foundations
- Calculator
- Exponentials and Logarithms
- Complex Numbers

Equations and Inequalities
- Equations and Inequalities
- Systems of Equations and Inequalities

Functions and Graphs
- Functions
- Lines
- Polynomials and Polynomial Functions
- Conics

Geometry

Spiritual Goals

God's intended purpose for mathematics:

1. To teach the child that there is logic and order in arithmetic and that there is logic and order in God's plan.
2. To teach that God cares for numbers and has recorded many for our information.
3. To teach that God commanded men to count, measure, and record information.
4. To teach the child that God is concerned that we be accurate and orderly in our use of weights, measure, and numbers.
5. To teach the child not to place too much confidence in the size.

expressing generalizations and as means for analyzing and understanding a broad variety of mathematical relationships. Students also use functions as well as symbolic reasoning to represent and connect ideas in geometry, probability, statistics, trigonometry, and calculus and to model physical situations. Students use a variety of representations (concrete, pictorial, numerical, symbolic, graphical, and verbal), tools, and technology (including, but not limited to, calculators with graphing capabilities, data collection devices, and computers) to model functions and equations and solve real-life problems.

(2) As students do mathematics, they continually use problem-solving, language and communication, connections within and outside mathematics, and reasoning (justification and proof). Students also use multiple representations, technology, applications and modeling, and numerical fluency in problem-solving contexts.

(c) Knowledge and skills.

(1) The student defines functions, describes characteristics of functions, and translates among verbal, numerical, graphical, and symbolic representations of functions, including polynomial, rational, power (including radical), exponential, logarithmic, trigonometric, and piecewise-defined functions.

The student is expected to:

- Foundations of Geometry
- Angles
- Circles
- Polygons
- Plannar Area
- Surface Area
- Volume
- Constructions

Sequences and Series

Matrices

Trigonometry

- Functions and Graphs
- Identities and Inequalities

Applied Mathematics

- Word Problems
- Statistics and Probability

Proofs

- Elements of Proofs
- Theorems

Correlation with TEKS

Advanced Mathematics

Saxon Publishers, Inc.
Student ISBN
978-1-56577-039-3
Teacher ISBN
978-1-56577-040-9

6. To teach the child the concept of measurement to express men's failure and His plans for man.
7. To develop skills in reasoning which reveal truth.
8. To understand that God has given man the ability to observe reality.
9. To understand that God has given man the ability to explore and to formulate relationships.
10. To understand that human reasoning is a reflection of the divine.
11. To appreciate the structure, form, and beauty of God's creation.
12. To appreciate the complexity and precision of God's creation
13. To improve the student's reasoning skills to help hi think less like the world and more like God.
14. To cultivate preciseness in Calculations and reasoning powers.
15. To develop an appreciation for correctness of procedure and accuracy in dealing with facts.
16. To make him aware of his own limitations and need to depend upon the Lord for understanding.
17. To develop skills in thrift and good stewardship to prepare him for successful living in the world.

Biblical Integration Truth Statements

1. ***What is prime reality, the really real?***
   God exists and is the ultimate reality. (Psalm 90:2, Revelation 22:13)

(A) describe parent functions symbolically and graphically, including f(x) = xn, f(x) = 1n x, f(x) = loga x, f(x) = 1/x, f(x) = ex, f(x) = |x|, f(x) = ax, f(x) = sin x, f(x) = arcsin x, etc.;	Lessons 14, 19, 22, 26, 32, 40, 41, 43, 49, 62, 94, 88, 98, 47, 114, 122	a. God designed, created, and sustains His creation. (Genesis 1:1-31)
(B) determine the domain and range of functions using graphs, tables, and symbols;	Lessons 21, 24, 32, 40. 41, 43, 94, 98	b. God is good, holy, and loving. (Luke 18:19, 1 John 4:16, 1 Peter 1:16, Psalm 145:12)
(C) describe symmetry of graphs of even and odd functions;	Lessons 43, 47, 57, 76, 84, 94	c. God is omniscient – all knowing. (Romans 11:33-36, Psalm 147:5)
(D) recognize and use connections among significant values of a function (zeros, maximum values, minimum values, etc.), points on the graph of a function, and the symbolic representation of a function; and	Lessons 19, 22, 43, 45, 114, 122, 125	d. God is sovereign – nothing is beyond His ultimate interest, control, and authority. (Daniel 4:25)
(E) investigate the concepts of continuity, end behavior, asymptotes, and limits and connect these characteristics to functions represented graphically and numerically.	Lessons 19, 29, 45, 43, 26, 114, 121, 122, 125	e. God is personal and also triune- He is coequally and coeternally God the Father, God the Son, Jesus, and God the Holy Spirit. (Hebrews 1:3)
(2) The student interprets the meaning of the symbolic representations of functions and operations on functions to solve meaningful problems.		**2. *What is the nature of external reality, that is, the world around us?***
The student is expected to:		a. God is the source of everything and created the universe out of nothing. (Genesis 1:1)
(A) apply basic transformations, including a • f(x), f(x) + d, f(x - c), f(b • x), and compositions with absolute value functions, including |f(x)|, and f(|x|), to the parent functions;	Lessons 19, 22, 26, 31, 40, 43, 47	b. The universe was created by God to be orderly. (Isaiah 45:18, Psalm 147:4)
(B) perform operations including composition on functions, find inverses, and describe these procedures and results verbally, numerically, symbolically, and graphically; and	Lessons 21, 24, 32, 50	c. God is constantly involved in the unfolding pattern of the ongoing operation of the universe. (Psalm 24:1-2, Psalm 32:13-15)
(C) investigate identities graphically and verify them symbolically, including logarithmic properties, trigonometric identities, and exponential properties.	Lessons 14, , 26, 36, 40, 41, 49, 72, 76, 80, 81, 88, 90, 93, 96, 98	d. The universe reflects His glory. (Psalm 8:1, Psalm 19:1)
(3) The student uses functions and their properties, tools and technology, to model and solve meaningful problems.		**3. *What is a human being?***
The student is expected to:		a. God created humans to know Him intimately and to have a loving relationship with Him. (Psalm 100:3)
(A) investigate properties of trigonometric and polynomial functions;	Lessons 11, 14m 16, 19, 32, 38, 41, 43, 47, 76, 94, 113, 114, 116, 117, 118, 125	b. Human beings are created in the
(B) use functions such as logarithmic, exponential, trigonometric, polynomial, etc. to model real-life data;	Lessons 11, 14, 19, 32, 38, 43, 45, 47, 68, 88, 98, 125	
(C) use regression to determine the appropriateness of a linear function to model real-life data (including using technology	Lessons 45, 125	

to determine the correlation coefficient); (D) use properties of functions to analyze and solve problems and make predictions; and (E) solve problems from physical situations using trigonometry, including the use of Law of Sines, Law of Cosines, and area formulas and incorporate radian measure where needed. **(4) The student uses sequences and series as well as tools and technology to represent, analyze, and solve real-life problems.** *The student is expected to:* (A) represent patterns using arithmetic and geometric sequences and series; (B) use arithmetic, geometric, and other sequences and series to solve real-life problems; (C) describe limits of sequences and apply their properties to investigate convergent and divergent series; and (D) apply sequences and series to solve problems including sums and binomial expansion. **(5) The student uses conic sections, their properties, and parametric representations, as well as tools and technology, to model physical situations.** *The student is expected to:* (A) use conic sections to model motion, such as the graph of velocity vs. position of a pendulum and motions of planets; (B) use properties of conic sections to describe physical phenomena such as the reflective properties of light and sound; (C) convert between parametric and rectangular forms of functions and equations to graph them; and (D) use parametric functions to simulate problems involving motion. **(6) The student uses vectors to model physical situations.** *The student is expected to:* (A) use the concept of vectors to model situations defined by magnitude and direction; and (B) analyze and solve vector problems generated by real-life situations.	Lessons 32, 43, 47, 45, 68, 88, 98, 125 Lessons 1, 14, 32, 36, 39, 41, 43, 47, 50, 60, 76, 72, 80, 81, 85, 87 90 93, 94, 96 Lessons 45, 86, 104, 107, 125 Lessons 45, 86, 104, 125 Lessons 104, 107 Lessons 86, 104, 107 Lessons 42, 54, 71, 78, 106, 123 Lessons 42, 54, 71, 78, 106, 123 Teacher-generated materials Teacher-generated materials Lessons 1, 14, 30 Lessons 1, 14, 30	image of God with the capacity to choose. (Genesis 1:27, Proverbs 8:10) c. Adam and Eve chose disobedience and brought death to themselves and sin entered the world. (Romans 5:12) d. All human beings have a choice and all have chosen sin that brings separation from God. (Romans 3:23) e. Sin is rebellion against God's wishes and ways and this destroys our relationship with God. (Romans 8:7-8) f. God provides a way back to Himself through the death of His son Jesus (the second person of the Trinity), on the cross. (John 3:16, Romans 6:23) g. Human beings must respond to God with repentance of our sins, receiving forgiveness, and accepting Jesus as our Savior. (Romans 10:9-10) **4. *What happens to a person at death?*** a. For each person death is either the gate to life with God and His people or the gate to eternal separation from God. (1 Corinthians 50:52) b. After death, your soul will continue to exist in an eternal way and there is a final judgment by God. (Revelation 20:12) c. Everyone chooses to honor and love Him by accepting Jesus as our Lord and Savior or makes a

Student Activities
Cooperative Learning
Graphic Organizers
Small Groups
Drawing
Manipulatives

Teaching Strategies
Direct Instruction
Open-ended Questions
Discussion
Demonstration
Brainstorming
Problem Solving
Read Aloud
Facilitating
Cooperative Learning

Evaluation Procedures
Observation
Class Participation
Quizzes/Tests

Other Resources and Bibliography
None

choice to reject Jesus and grasp for self-fulfillment and personal glory. (Romans 6:23)

d. Those who received Jesus as Savior will spend eternity in Heaven with God. (Philippians 4:10-21)

e. Those who rejected Jesus as Savior will spend eternity in Hell without God. (Hebrews 10:26-27)

5. ***Why is it possible to know anything at all?***

a. Human beings can both know the world around them and God Himself because God has built within them the capacity to do so and because He takes an active role in communicating with them. (John 16:13)

b. God's own intelligence is the basis of human intelligence. Knowledge is possible because there is something to be known (God and His creation) and someone to know (God and human beings made in His image). (Genesis 1:27)

c. God reveals, Himself to us in two basic ways: by general revelation and by special revelation. (Exodus 3:2, Psalm 19:1-4)

d. In general revelation, God speaks through the creation of the universe and through His word, the Bible. (2 Samuel 22:31, Psalm 19:1)

		➢ The Bible is internally consistent and unified in its principles and claims. ➢ There is tremendous coherence across the many authors and centuries during which the various books were written and in which its stories unfold. ➢ It is relevant to all the cultures of the world e. Special revelation is God revealing Himself through supernatural ways. Jesus Christ is the ultimate special revelation. He showed us what God is like more fully than any other form of revelation can. Because Jesus was also completely human, he spoke more clearly to us than any other form of revelation can. (John 14:7) ***6. How do we know what is right and wrong?*** *a.* Ethics or the knowledge of right and wrong is based on the character of God as good (holy and loving). (Psalm 33:4) b. There is an absolute standard by which all moral judgments are measured and God Himself – His character of goodness (holiness and love) – is the standard. (1 Samuel 2:3) c. As a result of sin, morally, we have become less able to discern good and evil and less able to

know God as He truly is. (Proverbs 1:7)

d. God has revealed His standard in the various laws and principles expressed in the Bible. (Psalm 111:10)
   - He has dictated absolute moral truth to us.
   - Every truth must conform to Biblical principles.
   - Every choice must reflect God's moral truth.
   - We must promote, defend, and teach these truths to others.

7. ***What is the meaning of human history?***
   a. History is a meaningful sequence of events leading to the fulfillment of God's purposes for humanity. (Psalm 22:27-28, Psalm 47:3)
   b. History is going somewhere, directed toward a known end. (Matthew 25:34)
   c. History is a form of revelation, not only does God reveal Himself in history, but the very sequence of events is revelation. (Psalm 33:13-14, Psalm 47:9)
   d. History has meaning because God is behind all events, not only sustaining all things by His powerful word but also in all things working for the good of those who love Him. (Psalm 40:5, Romans 8:28)

What should our response be to God?

		What were we made for? **We were made to** **Love** – Matthew 22:37, **Worship** – Romans 12:1, **Obey** – 2 John 6, and **Give Glory** – Psalm 96:3.