Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow

Course **Introduction to Calculus**

Course Description

This course includes the study of polynomial, trigonometric, rational, exponential, and logarithmic functions. Topics in trigonometry include the circular functions, trigonometric identities, radian measure, graphs of trigonometric functions, and solving equations. Topics of differential calculus include limits, formal definition of a derivative, and rules of differentiation. Problem solving and analysis using graphing calculators are integral components of this course.

Content Standards

Functions

Interpreting Functions

1. Analyze functions using different representations.

Building Functions

1. Build a function that models a relationship between two quantities.
2. Build new functions from existing functions.

Trigonometric Functions

1. Extend the domain of trigonometric functions using the unit circle.
    - Use special triangles to determine geometrically the exact values of sine, cosine, tangent and extend the understanding to the other three quadrants in the unit circle.
    - Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
2. Model periodic phenomena with trigonometric functions.
3. Prove and apply trigonometric identities.

Geometry

Similarity, Right Triangles, and Trigonometry

1. Apply trigonometry to general triangles.
    - Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Calculus

Limits

1. Find the limit of a function.
2. Use limits to determine of a function in continuous.

Derivatives

1. Determine the first derivative of a function using the limit definition.
2. Calculate derivatives using the Power Rule and Chain Rule as a shortcut to the limit definition.
3. Graph a function and its derivative.
4. Calculate the second derivative of a function and use it to determine concavity.

Mathematical Practice Standards

- Making sense of problems and persevering in solving them
- Reasoning abstractly and quantitatively
- Constructing viable arguments and critiquing the reasoning of others
- Modeling with mathematics
- Using appropriate tools strategically
- Attending to precision
- Looking for and making use of structure
- Looking for and expressing regularity in repeated rea-

Units	Essential Questions	Key Activities
An Overview of Functions	• When is it more appropriate to analyze a function algebraically? Graphically? • Can all transformations of basic functions be represented in a predictable algebraic way?	⇒ Whole class instruction ⇒ Small group instruction ⇒ Formative assessments ⇒ Summative assessments ⇒ Performance tasks ⇒ Group projects ⇒ Explorations with technology ⇒ Real-world application problems
Polynomial and Rational Functions	• What makes an accurate sketch of a polynomial function? • What is the best way to find the zeros of a polynomial function?	
Exponential and Logarithmic Functions	• Why do we need the logarithm function? • What real-world phenomena are modeled by exponential or logarithmic functions?	
Trigonometric Functions and Identities	• What is the value in knowing trig identities? • How does the unit circle solidify (and enhance) our understanding of trig functions? • What is the purpose of measuring angles in radians? • What is the relationship between a trig equation and the trig function's graph? • What is the algebraic and graphical relationship between trig equations and quadratic/linear equations?	
Limits	• What is a limit? • How do we know if a limit exists? • What is the importance of the concept of • continuity?	
Derivatives	• What is the relationship between the slopes of tangent lines and rates of change? • How do you use the definition and limits to calculate a derivative? • What is the difference between average and instantaneous rates of change? • When are the various techniques of differentiation appropriate?	

Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow

Curriculum Guide Overview

Curriculum Guide	Curriculum guides are public documents aligned with the Massachusetts Department of Education Curriculum Frameworks. They focus on the set of standards that students will learn within certain disciplines at appropriate grade levels. Each area of the curriculum is divided into general strands (broad categories) under which the standards fall. When we discuss "standards-based education" we mean that students are measured against their proficiency and growth towards meeting these standards. Curriculum Guides are intended for teachers, parents, and the wider school community as an overview document of the course of study for the year.
Curriculum Map	Curriculum maps are internal documents utilized as planning tools for teachers. Curriculum maps keep a focus on the end-of-year standards and chart a course for the teaching and learning over the year. They are typically organized in a grade-level overview organized by month or marking period. Curriculum maps typically include; standards and expectations for the grade/content, essential skills/ concepts, methods of assessment, and major content resources. Maps are never "done" as ongoing work of educators include revisions, additions, and revisits to the maps. They provide an overview for the year while also allowing educators to see a vertical picture of how the content develops as students progress through each grade.
Standards	The standards used as the foundation of our curriculum come directly from the Massachusetts Department of Education Curriculum Frameworks. State standards may be viewed here: http://www.doe.mass.edu/frameworks/
Priority Areas	Priority areas are defined by the state of Massachusetts as the most critical areas in each grade level on which instructional time should focus.
Mathematical Practice Standards	Mathematical Practice Standards are a set of skills/behaviors that are replicated in grades preK-12. These standards describe ways in which students engage with the mathematical content and the level of application grows increasingly complex as students progress vertically throughout their education.
Content Standards	The Content Standards describe what students should know and be able to do once within the area of mathematics.
Essential Questions	Essential questions are questions that are not answerable with an easy answer or a simple instruction. The purpose of essential questions is to provide opportunities for inquiry into the learning and act as an umbrella to anchor the unit/lesson.
Resources	Resources identified in Curriculum Guides are not intended to be exhaustive, nor are they intended to be prescriptive. The resources identified may function as a menu of curriculum resources from which educators identify the most appropriate tools to utilized in their classrooms. More specifics about identified resources are identified within the curriculum map documents.