Saddlebrook Preparatory School

Curriculum Map - Scope and Sequence: High School Calculus

Purpose of Planning	Unit One Q1, W1 – 2	Unit Two Q1, W3 - 6	Unit Three Q1, W7 – Q2, W2	Unit Four Q2, W3 - 7	Unit Five Q2, W8 – Q3, W4
Unit Topic and Overview:	**Precalculus Review**	**Limits**	**Differentiation**	**Applications of Differentiation**	**Antidifferentiation and Integration**
Prerequisite Student Knowledge *What should students have previously mastered prior to this unit?	Students should know about functions, graphs, and slope.	Students should be able have a basic understanding of the concept of a limit.	Students should be able to write the equation of a line given two points and understand limits.	Students should know the differentiation rules from the previous unit and should know what displacement, velocity, and acceleration are.	Students should know the area of a rectangle and know the derivatives of polynomial, rational and trigonometric functions.
Essential Knowledge & Student Expectations *What are the anticipated learning outcomes for students?	Students will have a deeper understanding of functions, graphs, and slope. Essential Question: How does the graph of a function visually impart properties of the function?	Students will be able to determine limits of functions analytically, graphically and numerically, determine one-sided limits, determine the continuity of a function and understand infinite limits. Essential Question: How do we use limits to understand how functions behave?	Students will be able to determine the derivative of an algebraic function using the definition and the sum, difference, product, quotient, and chain rules, and calculate related rates. Essential Question: How do we determine the instantaneous rate of change of a function at a point?	Students will be able to find maximum and minimum points of functions using the derivative and its properties, solve optimization problems, and use differentials. Essential Question: How can we use derivatives to determine relative maxima and minima?	Students will be able to determine antiderivatives of functions and understand the connection between the area under the graph of the function and the integral. Essential Question: How can we determine the area under the graph of a function?
Anchor Text and Supplemental Texts *Illustrate texts used, and how students' knowledge builds across units.	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)

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Multi-Media Links: *Videos, presentations, any and all supplemental online material.	Khan Academy http://www.storyofmathematics.com/17th_newton.html Teacher Facebook page	Khan Academy Teacher Facebook page	Khan Academy Teacher Facebook page	Khan Academy Teacher Facebook page	Khan Academy Teacher Facebook page
Instructional Practices: * Various Instructional Modalities, including Technology used	-Lecture with examples with and without a graphing calculator -Examine essential questions -Class discussion -Bell work -Homework (Practice)	-Lecture with examples with and without a graphing calculator -Examine essential questions -Class discussion -Bell work -Homework (Practice)	-Lecture with examples with and without a graphing calculator -Examine essential questions -Class discussion -Bell work -Homework (Practice)	-Lecture with examples with and without a graphing calculator -Examine essential questions -Class discussion -Bell work -Homework (Practice)	-Lecture with examples with and without a graphing calculator -Examine essential questions -Class discussion -Bell work -Homework (Practice)
Assessments: *Types and Measurements of Mastery	**Informal Assessments:** Teacher questioning/class discussion, practice problems **Formal Assessments:** Unit test, quizzes, assignments, bell work, homework, class work. 80% of students will average a score of 80% on unit assessments.	**Informal Assessments:** Teacher questioning/class discussion, practice problems **Formal Assessments:** Unit test, quizzes, assignments, bell work, homework, class work. 80% of students will average a score of 80% on unit assessments.	**Informal Assessments:** Teacher questioning/class discussion, practice problems **Formal Assessments:** Unit test, quizzes, assignments, bell work, homework, class work. 80% of students will average a score of 80% on unit assessments.	**Informal Assessments:** Teacher questioning/class discussion, practice problems **Formal Assessments:** Unit test, quizzes, assignments, bell work, homework, class work. 80% of students will average a score of 80% on unit assessments.	**Informal Assessments:** Teacher questioning/class discussion, practice problems **Formal Assessments:** Unit test, quizzes, assignments, bell work, homework, class work, final exam. 80% of students will average a score of 80% on unit assessments.

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Interdisciplinary Lessons & Projects: *State additional content areas and title all lesson(s) and project(s)	Assignment: Read and write on: "The Story of Mathematics – Newton" webpage. History, Physics	Assignment: Calculate the escape velocity of a rocket using limits. Engineering	Assignment: Use the derivative to determine whether lines are straight or curved in optical illusions. Art	Assignment: Determine from historical data information about the flooding of the Connecticut River in Northampton, Massachusetts. History, Science	Assignment: Use the integral to find the length of the Spiral of Archimedes as a function of θ. Measurement, History
Honors Course Differentiation(s):	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q1 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q1 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q1 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q2 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q2 project
Integrated Common Core or NGSSS Standards (List): *See Below for Links	CCSS.MATH.CONTENT.HSF.IF.A.2 CCSS.MATH.CONTENT.HSF.IF.B.6	NGSSS MAFS.912.C.1.1 NGSSS MAFS.912.C.1.10 NGSSS MAFS.912.C.1.11 NGSSSMAFS.912.C.1.12	NGSSS MAFS.912.C.2.1 NGSSS MAFS.912.C.2.10 NGSSS MAFS.912.C.2.11 NGSSS MAFS.912.C.2.2 NGSSS MAFS.912.C.2.4 NGSSS MAFS.912.C.2.5 NGSSS MAFS.912.C.2.6 NGSSS MAFS.912.C.2.8	NGSSS MAFS.912.C.3.1 NGSSS MAFS.912.C.3.10 MGSSS MAFS.912.C.3.2 NGSSS MAFS.912.C.3.3 NGSSS MAFS.912.C.3.4 NGSSS MAFS.912.C.3.5 NGSSS MAFS.912.C.3.8 NGSSS MAFS.912.C.3.9	NGSSS MAFS.912.C.4.1 NGSSS MAFS.912.C.4.2 NGSSS MAFS.912.C.4.3 NGSSS MAFS.912.C.4.4 NGSSS MAFS.912.C.4.5 NGSSS MAFS.912.C.4.6: NGSSS MAFS.912.C.4.8
Integrated CCSS <u>Writing Standards</u> (List): *See Below for Links	CCSS.ELA-Literacy.W.9-10.1.d CCSS.ELA-Literacy.W.9-10.2.d	CCSS.ELA-Literacy.W.9-10.1.d CCSS.ELA-Literacy.W.9-10.2.d	CCSS.ELA-Literacy.W.9-10.1.d CCSS.ELA-Literacy.W.9-10.2.d	CCSS.ELA-Literacy.W.9-10.1.d CCSS.ELA-Literacy.W.9-10.2.d	CCSS.ELA-Literacy.W.9-10.1.d CCSS.ELA-Literacy.W.9-10.2.d

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Links to CCSS/NGSSS Curriculum Standards:	The following links will be used to incorpotae the CCSS and other applicable standards: • The Common Core State Standard expectations in high school. • The K-12 English LA and Content Area Writing Standards • The K-12 Reading Standards • The K-12 Mathematics Standards • The K-12 NGSSS Science & Social Studies Standards				
Purpose of Planning	**Unit Six** **Q3, W5 – W9**	**Unit Seven** **Q4, W1 – W4**	**Unit Eight** **Q4, W5 – W9**		
Unit Topic and Overview:	**Calculus of Transcendental Functions**	**Differential Equations**	**Applications of Integration**		
Prerequisite Student Knowledge *What should students have previously mastered prior to this unit?	Students should have a good understanding of exponential and logarithmic functions, their properties, and their inverse relationship.	Students should know about vectors, exponential functions, and integration.	Students should know how to find definite and indefinite integrals, and understand area and volume.		
Essential Knowledge & Student Expectations *What are the anticipated learning outcomes for students?	Students will be able to differentiate and integrate logarithmic, exponential, inverse trigonometric and hyperbolic functions. Essential Question: How do we differentiate and integrate certain transcendental functions?	Students will be able to approximate and explicitly determine the general and specific solutions for simple differential equations Essential Question: What are differential equations and how do we use calculus to solve them?	Students will be able to use integration to calculate the volumes of solids of revolution, arc lengths of curves defined by a function, surfaces of revolution, and work done. Essential Question: How can we apply integration to calculate areas, arc lengths, and work?		

Anchor Text and Supplemental Texts *Illustrate texts used, and how students' knowledge builds across units.	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)	**Anchor Text:** *Calculus AP* Edition,* Ninth Edition by Larson /Edwards (Brooks/Cole CENGAGE Learning, 2010)		
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Interdisciplinary Lessons & Projects: *State additional content areas and title all lesson(s) and project(s)	Assignment: Determine characteristics of the Gateway Arch in St. Louis from the equation of its weighted catenary shape. Architecture	Assignment: Determine a person's weight loss by solving the differential equation that comes from a linear diet model. Health, Nutrition	Assignment: Determine the volume of the planet Saturn using spherical and oblate models. Astronomy		
Honors Course Differentiation(s):	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q3 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q4 project	-Additional test questions involving higher order questioning to demonstrate mastery -Additional homework problems -Q4 project		
Integrated Common Core or NGSSS Standards (List): *See Below for Links	NGSSS MAFS.912.C.2.3 NGSSS MAFS.912.C.2.4 NGSSS MAFS.912.C.2.5 NGSSS MAFS.912.C.2.9	MAFS.912.C.5.1 MAFS.912.C.5.2 MAFS.912.C.5.3 MAFS.912.C.5.4	MAFS.912.C.5.5 MAFS.912.C.5.7 MAFS.912.C.5.8		

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