Seymour Public Schools Curriculum

Grade: 11-12	Subject: **AP Calculus** Lines and Functions (Algebraic and Transcendental)
CSDE Standard	25.1 Algebraic Reasoning: Patterns and Functions
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What types of functions have inverses? What are the basis properties of a linear function? What are the basic properties of a quadratic function?
Content Standard:	25.1.1.9.3 Students will identify the characteristics of functions and relations including domain and range. 25.1.1.9.5 Students will describe and compare properties and classes of functions including exponential, polynomial, rational, logarithmic and trigonometric. 25.1.2.9.1 Students will represent functions and relations on the coordinate plane. 25.1.2.9.2 Students will identify an appropriate symbolic representation for a function or relation displayed graphically or verbally. 25.1.2.9.3 Students will recognize and explain the meaning of the slope and x- and y-intercepts as they relate to a context, graph, table or equation. 25.1.2.9.4 Students will evaluate and interpret the graphs of linear, exponential, and polynomial functions.

Seymour Public Schools Curriculum

Performance Expectations (Student outcomes)	Lines and Functions (a) Handle linear functions using either point-slope, slope intercept or standard forms (b) Understand the concept of slope © Handle quadratic, polynomial and rational functions (d) Algebraically solve equations and relate this to the horizontal intercepts of the function. (e) Understand and manipulate the 6 trigonometric functions (f) Understand the exponential and logarithmic functions – emphasis on base *e*, but all bases included (g) Manipulate functions arithmetically: the sum, difference, product and quotient of functions

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
	Chapter Zero	

Seymour Public Schools Curriculum

Grade: 11-12	Subject: **AP Calculus** Limits and Continuity
CSDE Standard	25.1 Algebraic Reasoning: Patterns and Functions
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What does it mean for a function to be continuous on an interval? What are the basic types of discontinuity? How is a function's differentiability at a point related to its continuity? When can the Intermediate Value Theorem be of use? What is an average rate of change over a given interval? What is a limit?
Content Standard:	25.1.1.9.11 Students will apply the concepts of limits to sequences and asymptotic behavior of functions.
Performance Expectations (Student outcomes)	Limits and Continuity (a) Understand the underlying concept of a limit (b) Compute limits of functions directly and by putting together pieces of various limits © Understand the idea of tolerance in the definition of limits (d) Decide whether functions given either by formula or by graph are continuous at specific points or on specific intervals (e) Understand limits involving infinity and connection with asymptotic behavior of a function (f) Understand and apply basic properties of continuity, such as the intermediate value theorem, the squeeze

Seymour Public Schools Curriculum

	(sandwich) theorem and the bisection method for finding roots of equations	
Strategies/Modes (examples)	**Materials/Resources (examples)** Chapter 1	**Assessments (examples)**

Grade: 11-12	**Subject: AP Calculus** Differentiation
CSDE Standard	25.1 Algebraic Reasoning: Patterns and Functions
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	How does the rate of change of one variable have an effect on another? What is the strategy for solving related rates problems? What are the hypotheses and conclusions of the Mean Value Theorem and Rolle's Theorem? What is the First and Second Derivative Tests for a function? What is an inflection point/ What do the derivatives of a function tell you about the shape of its graph?

Seymour Public Schools Curriculum

Content Standard:	25.1.2.9.5 Students will relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes and line of symmetry for that function. 25.1.2.9.7 Students will recognize that the slope of the tangent line to a curve represents the rate of change.
Performance Expectations (Student outcomes)	Differentiation Chapter 2 Understanding local linearity of differentiable functions, both graphically and in terms of tangent-line approximation of such functions; an introduction to L'H^opital's rule using linear approximations (b) Describe rates of change via derivatives, including modeling of simple physical processes (related rates, simple differential equations of motion, etc.) I Apply the chain rule and basic rules of differentiation of algebraic, trigonometric, exponential and logarithmic functions (d) Use implicit differentiation to approximate implicitly-defined functions near known points (e) State the mean-value theorem analytically and graphically, and understand how it is applied to describe increasing and decreasing functions, etc. (f) Relate signs of first and second derivatives to intervals of increase, decrease and fixed concavity, and to apply first- and second- derivative tests for local extrema (g) Use Newton's method to approximate roots of algebraic and transcendental equations (h) Set up and solve applied optimization problems, as well as more ambitious ones for which Newton's method or other approximation techniques are appropriate Chapter 2 Generate (on a graphing calculator or computer) accurate graphs of functions, and to relate those graphs to behavior of first and second derivatives

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	Chapter 2 and Chapter 3	

Grade: 11-12	Subject: **AP Calculus** Integration
CSDE Standard	25.3 Geometry and Measurement
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What is the relationship between definite integrals and area? What is the Fundamental Theorem of Calculus and why is it so important? How do you define and calculate the area of the region between the graphs of two continuous functions? How do you define and calculate the volumes of solids by the method of slicing?

Seymour Public Schools Curriculum

Content Standard:	25.3.3.9.4 – Students will use two dimensional representations, formal, and informal methods to solve surface area and volume problems.
Performance Expectations (Student outcomes)	Integration (a) Working understanding of the definite integral as a limit of sums whose value can be approximated numerically by midpoint, left-endpoint, and right-endpoint Riemann sums (b) Capacity to use definite integrals (relative to either axis when appropriate) to calculate areas (c) Use definite integrals to calculate volumes (by slicing, disks and washers) (d) Compute antiderivatives by power rule and change of variable (u-substitution) (e) Use both parts of the fundamental theorem (f) Understanding of velocity vs. position in terms of derivative vs. antiderivative; understanding of the mean-value theorem for integrals (g) Approximate definite integrals when antidifferentiation is inapplicable or impractical

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
	Chapter 4 and Chapter 5	Tests, Quizzes and Alternative Assessments

Seymour Public Schools Curriculum

Grade: 11-12	**Subject:** AP Calculus Logarithmic, Exponential and other Transcendental Functions
CSDE Standard	25.1 Algebraic Reasoning: Patterns and Functions
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	How can we determine a rate of growth or decay from data?
Content Standard:	25.1.3.9.6 Students will use logarithms, vectors and matrices to solve problems.
Performance Expectations (Student outcomes)	Calculus of Logarithmic, Exponential and other Transcendental Functions Revisited (a) State and use the definite-integral definition of the natural logarithm function and its inverse exp (b) Differentiate and integrate expressions that involve ln and exp, and corresponding functions with bases other than e (c) Recognize and make rough hand sketches of the graphs of ln and exp using knowledge of the domain, range and derivative of each (d) Analyze and interpret slope fields (e) Analyze growth and decay phenomena, and to determine either time for a given size or size at a given time (f) Differentiate and integrate arcsine, arccosine and arctangent; knowledge of the domain and range of each of these functions

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	Chapter 5 5-1 to 5-2 Chapter 6 6-3 to 6-5 and 6-7 Chapter 7 7-1 to 7-4	