Math-U-See

Student _____

Record Keeping: *Calculus*

	Date	Test Score	Proficiency
Pretest (Unit Test I)			

		LESSON PRACTICE		TEACH BACK	LESSON PRACTICE		H	Lesson Test	Test Date
		A	B		C	D			
1	Terminology and Graphing								
2	Parabola, Circle, Ellipse								
3	Hyperbolas and Systems of Equations								
4	Functions								
5	Trigonometry								
6	Exponential and Logarithmic Functions								
7	Limits								

	Date	Test Score	Proficiency
Posttest (Unit Test I)			

LESSON OBJECTIVES

Lesson 1 Terminology and Graphing

- ☐ CA.1.a Define the terms variable, constant, coefficient, function, interval, tangent line, and secant line
- ☐ CA.1.b Graph one-dimensional equations containing absolute value expressions
- ☐ CA.1.c Graph two-dimensional equations containing absolute value expressions
- ☐ CA.1.d Classify graphs based on their equation
- ☐ CA.1.e Graph piecewise functions
- ☐ CA.1.f Write piecewise functions of given graphs
- ☐ CA.1.g Explain continuity by analogy

Lesson 2 Parabola, Circle, Ellipse

- ☐ CA.2.a Graph a line given an equation in x and y
- ☐ CA.2.b State the center and radius of a circle given its equation
- ☐ CA.2.c State the center and extremities of an ellipse based on its equation
- ☐ CA.2.d Graph a circle
- ☐ CA.2.e Graph an ellipse
- ☐ CA.2.f Plot points and sketch a parabola given its equation
- ☐ CA.2.g Plot a point and sketch a hyperbola given its equation

Lesson 3 Hyperbolas and Systems of Equations

- ☐ CA.3.a State the general standard form for the equation of a north-south or east-west hyperbola
- ☐ CA.3.b Graph a pair of equations when one or both are conic
- ☐ CA.3.c Find the solution of a system of linear or conic equations
- ☐ CA.3.d Graph conic inequalities

Lesson 4 Functions

- ☐ CA.4.a Define the term function
- ☐ CA.4.b Model the concept of a function
- ☐ CA.4.c State whether a given relation is a function, based on formula or graph
- ☐ CA.4.d Calculate the value of a function with various inputs
- ☐ CA.4.e State the domain and range of a function
- ☐ CA.4.f Explain the distinction between dependent and independent variables
- ☐ CA.4.g Rewrite a function in equation form using function notation
- ☐ CA.4.h Evaluate the sum or difference of two functions
- ☐ CA.4.i Evaluate the product or quotient of two functions
- ☐ CA.4.j Evaluate composite functions
- ☐ CA.4.k Write the inverse for a given function
- ☐ CA.4.l Use the horizontal line test to see if the inverse of a given function is also a function

Proficiency Guide: A (Advanced) 90–100% **P** (Proficient) 80–89% **NP** (Nearing Proficiency) 70–79% **BS** (Beginning Steps) Below 70%

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	Lesson 5	**Trigonometry**
☐	CA.5.a	Give the sine, cosine, and tangent for 0°, 30°, 45°, 60°, and 90° angles, without a calculator
☐	CA.5.b	Find trigonometric ratios for any angle with a reference angle of 0°, 30°, 45°, 60°, or 90°, without a calculator
☐	CA.5.c	Graph the function $y = \sin(x)$
☐	CA.5.d	Graph the function $y = \cos(x)$
☐	CA.5.e	Define period, shift, translation, and amplitude
☐	CA.5.f	Graph variations of the basic sine and cosine graphs
☐	CA.5.g	Determine the equation of a sine or cosine graph
	Lesson 6	**Exponential and Logarithmic Functions**
☐	CA.6.a	Define natural log as log base e
☐	CA.6.b	State the natural logs of zero and one
☐	CA.6.c	Explain the inverse relationship between e^x and $\ln(x)$
☐	CA.6.d	State the rules for $\ln(xy)$, $\ln(x/y)$, and $\ln(x^a)$
☐	CA.6.e	Simplify expressions using the natural log or exponential function
☐	CA.6.f	Solve equations using natural log or exponential functions
☐	CA.6.g	Sketch the graph of basic natural exponential functions without using a calculator
☐	CA.6.h	Sketch the graph of basic natural log functions without using a calculator
	Lesson 7	**Limits**
☐	CA.7.a	Identify the parts of limit notation
☐	CA.7.b	State the limit of a sum of two functions
☐	CA.7.c	State the limit of a quotient of two functions
☐	CA.7.d	State the limit of two functions
☐	CA.7.e	State the limit of a constant times a function
☐	CA.7.f	State the limit of the product of two functions
☐	CA.7.g	Give the mathematical definition of a limit

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Record Keeping: *Calculus*

	Date	Test Score	Proficiency
Pretest (Unit Test II)			

		LESSON PRACTICE		TEACH BACK	LESSON PRACTICE		H	Lesson Test	Test Date
		A	B		C	D			
8	Limits and Continuity								
9	Definition of a Derivative								
10	Derivative Rules								
11	Chain Rule								
12	Derivatives of Trig Functions								
13	Derivatives of e^x and $\ln(x)$								
14	Implicit Differentiation								

	Date	Test Score	Proficiency
Posttest (Unit Test II)			

LESSON OBJECTIVES

Lesson 8 Limits and Continuity

- ☐ CA.8.a Write the notation for infinity
- ☐ CA.8.b Give operational definitions of right- and left-handed limits
- ☐ CA.8.c Find the limit of a rational expression using any appropriate method
- ☐ CA.8.d Evaluate the limit of a function using graphing, substitution, or factoring
- ☐ CA.8.e Evaluate the limit of a function using conjugates or trigonometric identities
- ☐ CA.8.f Give the location of any vertical asymptotes in the graph of a function
- ☐ CA.8.g Give the location of any horizontal asymptotes in the graph of a function
- ☐ CA.8.h State three possible reasons for the non-existence of a limit

Lesson 9 Definition of a Derivative

- ☐ CA.9.a Define a derivative
- ☐ CA.9.b Identify a derivative as the slope of a tangent line
- ☐ CA.9.c Calculate the derivative of a function using the definition
- ☐ CA.9.d Explain the operation of the greatest integer function
- ☐ CA.9.e Describe a step function

Lesson 10 Derivative Rules

- ☐ CA.10.a State rules for the derivatives of a constant, a variable with respect to itself, the sum of two functions, the product of two functions, a constant times a function, a function raised to a power, and the quotient of two functions
- ☐ CA.10.b Apply derivative rules to find the derivatives of a constant, a variable with respect to itself, the sum of two functions, the product of two functions, a constant times a function, a function raised to a power, and the quotient of two functions

Lesson 11 Chain Rule

- ☐ CA.11.a State the chain rule
- ☐ CA.11.b Use the chain rule to differentiate composite functions
- ☐ CA.11.c Find the second and higher-order derivatives of functions
- ☐ CA.11.d List four situations where functions are not differentiable
- ☐ CA.11.e Identify non-differentiable sections of functions

Lesson 12 Derivatives of Trig Functions

- ☐ CA.12.a State the derivative of the sine and cosine functions
- ☐ CA.12.b Differentiate functions containing sine, cosine, tangent, secant, cosecant, or cotangent
- ☐ CA.12.c Differentiate functions by choosing and combining best strategies

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Lesson 13 Derivatives of e^x and ln(x)

- ☐ CA.13.a State the derivative of e^x
- ☐ CA.13.b Differentiate functions of the form $e^u\,dx$, where u is a function of x
- ☐ CA.13.c State the derivative of ln(x)
- ☐ CA.13.d Differentiate functions of the form ln(u), where u is a function of x
- ☐ CA.13.e Differentiate functions containing e^u and ln(u) expressions

Lesson 14 Implicit Differentiation

- ☐ CA.14.a State the derivative of y with respect to x
- ☐ CA.14.b Differentiate a function implicitly
- ☐ CA.14.c Find the normal line to a function at a given point

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Record Keeping: *Calculus*

	Date	Test Score	Proficiency
Pretest (Unit Test III)			

		LESSON PRACTICE		TEACH BACK	LESSON PRACTICE		H	Lesson Test	Test Date
		A	B		C	D			
15	Graphing with the 1st Derivative								
16	Graphing with the 2nd Derivative								
17	Mean Value Theorem; L'Hôpital's Rule								
18	Physics Applications								
19	Economics Applications								
20	Optimization								
21	Related Rates								

	Date	Test Score	Proficiency
Posttest (Unit Test III)			

LESSON OBJECTIVES

Lesson 15 Graphing with the 1st Derivative

- ☐ CA.15.a Define local and global minimum and maximum
- ☐ CA.15.b Define the terms maximum, minimum, and extremum
- ☐ CA.15.c Use the first derivative to find an extremum
- ☐ CA.15.d Determine whether an extremum is a maximum or minimum using the first derivative test
- ☐ CA.15.e State three places where extrema can exist in a function
- ☐ CA.15.f List types of critical points
- ☐ CA.15.g Find critical points in a function
- ☐ CA.15.h Sketch the graph of a function based on its critical points and its first derivative
- ☐ CA.15.i Identify positive-slope and negative-slope intervals on the graph of a function

Lesson 16 Graphing with the 2nd Derivative

- ☐ CA.16.a Give operational definitions for the terms concave up and concave down
- ☐ CA.16.b Define inflection point
- ☐ CA.16.c Define the term concavity
- ☐ CA.16.d Identify the concavity of an interval of a function using the second derivative test
- ☐ CA.16.e Distinguish between maxima and minima using the second derivative when the second derivative is not equal to zero
- ☐ CA.16.f Identify whether critical points are maxima, minima, inflection points, or none of these
- ☐ CA.16.g Describe situations where functions will have oblique asymptotes
- ☐ CA.16.h Find the equation for oblique asymptotes in a graph

Lesson 17 Mean Value Theorem; L'Hôpital's Rule

- ☐ CA.17.a Give an operational definition for the mean value theorem (MVT)
- ☐ CA.17.b State the necessary conditions for application of the MVT
- ☐ CA.17.c Find a value on an interval which satisfies the MVT
- ☐ CA.17.d Give an operational definition for Rolle's theorem
- ☐ CA.17.e Determine the existence of a root of a polynomial on an interval using Rolle's theorem
- ☐ CA.17.f Give an operational definition for L'Hôpital's rule
- ☐ CA.17.g State the necessary conditions for application of L'Hôpital's rule
- ☐ CA.17.h Calculate limits using L'Hôpital's rule
- ☐ CA.17.i Define even and odd functions
- ☐ CA.17.j State the connection between symmetry and function parity
- ☐ CA.17.k State whether a given function is odd, even, or neither

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Lesson 18 Physics Applications

- ☐ CA.18.a State the first and second derivative of position
- ☐ CA.18.b Find the velocity and acceleration functions for a given position function
- ☐ CA.18.c Find the velocity and acceleration at a particular moment in time, given the position function
- ☐ CA.18.d Solve word problems involving position, velocity, and acceleration by use of derivatives and algebra

Lesson 19 Economics Applications

- ☐ CA.19.a Explain the cost function, average cost function, price function, revenue function, and profit function
- ☐ CA.19.b Explain the marginal cost function
- ☐ CA.19.c Find the marginal cost function when given the cost function
- ☐ CA.19.d Maximize a revenue function
- ☐ CA.19.e Find the break-even point given cost and revenue functions

Lesson 20 Optimization

- ☐ CA.20.a Outline the general procedure for solving optimization problems
- ☐ CA.20.b Give an operational definition for a constraint equation
- ☐ CA.20.c Give an operational definition for an optimization equation
- ☐ CA.20.d Write a constraint equation
- ☐ CA.20.e Write an optimization equation
- ☐ CA.20.f Solve optimization problems

Lesson 21 Related Rates

- ☐ CA.21.a Give the general procedure for solving related-rates problems
- ☐ CA.21.b Differentiate between particular information and general information
- ☐ CA.21.c Write a set of equations for a related-rates problem
- ☐ CA.21.d Differentiate a related-rates equation with respect to time
- ☐ CA.21.e State the answer(s) to a related-rates word problem

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Pretest (Unit Test IV)			

		LESSON PRACTICE		TEACH BACK	LESSON PRACTICE		H	Lesson Test	Test Date
		A	B		C	D			
22	Antiderivatives								
23	Integration Formulas								
24	Area Under a Curve								
25	Definite Integrals								
26	Area Between Two Curves								
27	Inverse Trigonometric Functions								
28	Integration Using an Integral Table								
29	Differential Equations								
30	Integral Application: Differential Equations								

	Date	Test Score	Proficiency
Posttest (Unit Test IV)			

LESSON OBJECTIVES

Lesson 22 Antiderivatives

- ☐ CA.22.a Give an operational definition for an antiderivative
- ☐ CA.22.b Identify the integral operator
- ☐ CA.22.c Give the integral of zero and one
- ☐ CA.22.d State the sum rule for integrals
- ☐ CA.22.e State the power rule for integrals
- ☐ CA.22.f State the integral rule for a constant times a function
- ☐ CA.22.g Apply integration rules to find antiderivatives of simple functions
- ☐ CA.22.h Find a function through a given point which is the antiderivative of a given function

Lesson 23 Integration Formula

- ☐ CA.23.a Select an appropriate integration formula to be used for finding the antiderivative of a given function
- ☐ CA.23.b Integrate functions using substitution
- ☐ CA.23.c Introduce quantities as needed to make integration possible
- ☐ CA.23.d Change the form of an expression to simplify integration

Lesson 24 Area Under a Curve

- ☐ CA.24.a Give an operational definition for Riemann sums
- ☐ CA.24.b Give an operational definition for a definite integral
- ☐ CA.24.c Explain definite integral notation
- ☐ CA.24.d Write the formula that relates Riemann sums to a definite integral
- ☐ CA.24.e State the area under a curve when the upper and lower limit of an integral are equal
- ☐ CA.24.f Simplify an integral by moving a constant factor before the integral sign
- ☐ CA.24.g Integrate the sum of two functions
- ☐ CA.24.h Explain the result of reversing the upper and lower limits on a definite integral
- ☐ CA.24.i Explain the meaning and function of the vertical bar (evaluation bar)
- ☐ CA.24.j State the fundamental theorem of calculus
- ☐ CA.24.k Integrate simple functions
- ☐ CA.24.l Find the area between a curve and the *x*-axis over a defined interval
- ☐ CA.24.m State the meaning of area below the *x*-axis and above a curve

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Lesson 25 Definite Integrals

- ☐ CA.25.a Integrate more moderately complex functions using the rules, formulas, substitution, or simplification

Lesson 26 Area Between Two Curves

- ☐ CA.26.a Find pertinent integral limits in preparation for expressing the area between curves as the sum of definite integrals
- ☐ CA.26.b Find the area bounded by two defined curves
- ☐ CA.26.c Explain why it is sometimes useful to integrate with respect to *y* instead of *x* when finding area

Lesson 27 Inverse Trigonometric Functions

- ☐ CA.27.a Graph inverse trigonometric functions
- ☐ CA.27.b Find the derivative of functions containing inverse trigonometric functions, using applicable rules and strategies
- ☐ CA.27.c Find the antiderivative of functions containing inverse trigonometric functions, using applicable rules and strategies

Lesson 28 Integration Using an Integral Table

- ☐ CA.28.a Integrate more complex functions using rules from a table of integrals
- ☐ CA.28.b Integrate functions requiring repeated use of reduction formulas

Lesson 29 Differential Equations

- ☐ CA.29.a Find general solutions for first-order separable differential equations
- ☐ CA.29.b Find particular solutions for first-order separable differential equations

Lesson 30 Integral Application: Differential Equations

- ☐ CA.30.a Solve unbounded growth problems using differential equations
- ☐ CA.30.b Solve decay problems using differential equations
- ☐ CA.30.c Solve cooling problems using differential equations and Newton's Law of Cooling
- ☐ CA.30.d Solve continuously-compounding interest problems using differential equations
- ☐ CA.30.e Solve motion problems using differential equations

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