Portales Municipal Schools

CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What does the slope of a line represent? What is the deference between and explicitly defined function and an implicitly defined function? What is a function? What is domain and range? What are Piecewise functions? What is a composition of a function?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
1st Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	**PRECALCULUS REVIEW** A. Lines 1. Slope as a rate of change 2. Parallel/Perpendicular/ Equations of lines B. Functions of graphs 1. Functions 2. Domain and range 3. Families of functions 4. Piecewise functions 5. Composition of functions	<u>Graphing Calculator Exercises</u> Students will practice and review how to set and use graphing calculators to graph functions and find information about the functions- Deg/Rad, calc menu, zeros, max/min, etc.	Graphing Calculator with overhead projector capability

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What kind of real world situations can exponential growth and decay represent? What are inverse functions? How do you find the inverse of a function? Is the inverse of a function automatically a function? What is a logarithm? What do graphs of trigonometric functions look like? To what real world situations can trig functions be applied?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
1st Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	C. Exponential and logarithmic Functions 1. Exponential growth and decay 2. Inverse functions 3. Logarithmic functions 4. Properties of logarithms D. Trigonometric functions 1. Graphs of basic trigonometric functions 2. Applications	Parent Functions Card Matching - Create three sets of note cards, one with parent functions, the other with their graphs, a third with translations of the parent functions - Pass out the note cards, have students find matches. Assessment: Students will check each other.	Note cards

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What is a limit? When does a limit not exist? How do you find a limit with a table? Graph? Analytically?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
1st Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	**LIMITS AND CONTINUITY** A. Rates of change B. Limits at a Point 1. Properties of Limits 2. One and Two Sided C. Limits involving infinity 1. Asymptotic/End Behavior 2. Properties of Limits 3. Visualizing Limits	Students will watch the animated tutorials about limits (Four different tutorials) and utilize what they learn to evaluate various types of limits as assignments from the text. Assessment: Peer evaluation and teacher-created tests	http://tinyurl.com/25puo6

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What is continuity? How are limits and continuity related? What do we mean by instantaneous rate of change? What is the difference between instantaneous rate of change and average rate of change?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
1st Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	D. Continuity 1. Continuous functions 2. Discontinuous functions E. Instantaneous rates of change	Students will watch the animated tutorials concerning continuity and Intermediate Value Theorem and apply the knowledge acquired to analyzing properties of continuity and types of discontinuity. They will practice on assignments from the text. Assessment: Peer evaluation and teacher-created tests.	http://tinyurl.com/25puo6

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What is the formal definition of the derivative? Alternate form? How do you find the derivative of a function at a point? What is the slope of the tangent line? Is it necessary for a function to be continuous for it to be differentiable? What is the Product Rule for derivatives? Quotient Rule? When should each rule be used?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
2nd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	**THE DERIVATIVE** A. Definition of the derivative B. Differentiability 1. Local Linearity 2. Numeric derivatives using the calculator 3. Differentiability and continuity C. Derivatives of algebraic functions	Differentiation Matching Note Cards: - Create two sets of note cards – one with the original function and one with the derivative. - Pass out the cards and have students find their match Activity can be expanded by including graphs of the functions and their derivatives, the limit definition of derivatives or chains of functions where students need to line up according differentiation. Assessment: Students will check each other.	Note cards

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: How can the derivative be used to describe velocity and acceleration? What are the rules for differentiating trig functions?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
2nd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	D. Derivative rules when combining functions E. Applications to velocity and acceleration F. Derivatives of trigonometric functions	Students will watch the tutorial which describes how to use the slope of the curve to plot the derivative of the curve to assess how the graph of the derivative relates to the curve and apply that to many kinds of functions. They will practice through assignments from text. Assessment: peer evaluation Students will watch the animated tutorials concerning derivatives (Five are provided) and practice the various techniques of differentiation. These will be practiced through assignments from the text. Assessment: Peer evaluation and teacher-created tests In this exercise, students prove that the derivative of sine is cosine. Assessment: Peer evaluation	http://tinyurl.com/oztzgr http://tinyurl.com/25puo6 http://tinyurl.com/pkaml2

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What is the chain rule? When should it be applied? When can implicit differentiation be used? What are the rules for differentiating trigonometric functions? For logarithmic functions?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
2nd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	G. The chain rule H. Implicit derivatives 1. Differential method 2. y′ method I. Derivatives of inverse trigonometric functions J. Derivatives of logarithmic and exponential functions		

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What are critical numbers and what can they tell us? How can the derivative be used to describe the behavior of a function? What does it mean for a function to have absolute or local extrema? Why is differentiation an effective method to identify extrema?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
3rd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	APPLICATIONS OF THE DERIVATIVE A. Extreme values 1. Local (relative) extrema 2. Global (absolute) extrema B. Using the derivative 1. Mean value theorem 2. Rolle's theorem 3. Increasing and decreasing functions		

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: Why are we interested in points of inflection? What is meant by the concavity of a graph? What is the geometric significance of a point of inflection? How do you apply derivatives to solve real-life problems?

Calendar	Strand/Standard/ Benchmark	Concepts/Skills (All Master)	Suggested Student Activities/Assessments	Resources/Materials
3rd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	C. Analysis of graphs using the first and second derivatives 1. Critical values 2. First derivative test for extrema 3. Concavity and points of inflection 4. Second derivative test for extrema D. Optimization problems E. Linearization models F. Related rates	First and Second Derivatives Matching Note cards - Create three sets of note cards, function, first derivative, second derivative, and have students find "matching" sets of three *Activity can also use sets of graphs for the function, first derivative, second derivative so that students acquire understanding of visual connections between derivatives and functions. Assessment: Students will check each other	Note cards

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: How can we estimate the area under a curve using geometric shapes? How do limits related to areas under curves? What is integration and how is it applied? Why use definite integrals to solve problems?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
3rd Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	THE DEFINITE INTEGRAL A. Approximating areas 1. Riemann sums 2. Trapezoidal rule 3. Definite integrals B. The Fundamental Theorem of Calculus (part 1) C. Definite integral and antiderivatives D. The fundamental Theorem of Calculus (part 2)	Gum and Riemann Sums - Pass out a sketch of a simple graph - Have students slide around the sticks of gum so that the top of the gum is hitting the function where the top of the rectangles should be for the left, right, and midpoint sums. Assessment: Students will write a paper evaluating the accuracy of the left, right, and midpoint sum for each function examined using the Schaffer method.	Sticks of Gum, handouts

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: What are the different techniques for integration and how does one know when to apply each one? How does a slope field relate to its original function? How can definite integrals be used to solve real world problems?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
4th Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	DIFFERENTIAL EQUATIONS AND MATHEMATICAL MODELING A. Antiderivatives B. Integration using u-substitutes C. Separable differential equations 1. Growth and decay 2. Slope fields 3. General differential equations	Slope field Card Match - Construct 3 sets of cards. One set with slope field, one set with differential equations and one set with conclusions about the solutions of the differential equations. Students will pair up and work to find matching sets of three cards. Assessment: Students will discuss and check each other	Note cards, answer sheet

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CURRICULUM MAP

Subject:	Mathematics	**June 2009**	**Grade Level:**	Calculus

Essential Questions: How can definite integrals be used to derive common area and volume formulas? How do different methods for finding the volume of a solid compare?

Calendar	**Strand/Standard/ Benchmark**	**Concepts/Skills (All Master)**	**Suggested Student Activities/Assessments**	**Resources/Materials**
4th Nine Weeks	There are no standards for Calculus in the NM_S&MB. This course will follow the College Board suggested curriculum.	APPLICATIONS OF DEFINITE INTEGRALS A. Summing rates of change B. Particle motion C. Areas in the plane D. Volumes 1. Volumes of solids with known cross sections. 2. Volumes of solids of revolution using disk and shell methods	Three Dimensional Cross Section Project - Students will create a model of a solid composed of cross sections of a particular shape that fit the area under a curve. Students will find the volume of the solid correctly on a separate sheet of paper. * Assessment: Rubric including points for creativity, craftsmanship, presentation and mathematical accuracy.	Craft supplies for building the model http://tinyurl.com/pbt4kb (includes a rubric)