URBANDALE COMMUNITY SCHOOL DISTRICT

Course Title:	**AP Calculus**

Description: AP Calculus is designed to provide a thorough introduction into differential and integral calculus. It is comparable to the first year calculus course taught at some colleges and universities. Students who enroll in the course have the goals of getting a preview of calculus before college and/or acquiring sufficient skills and knowledge of the subject to enter a college mathematics program level higher than beginning calculus.
The overall objective of the course is to prepare students for the advanced placement test in calculus. Most colleges and universities grant college credit for scoring well on this exam. **AP Calculus corresponds to MAT 211 in the DMACC course guide.** To qualify for the 5 hours of DMACC credit, a student must complete the full year class (fall and spring semester) and register in the second semester with DMACC.

Reporting Topic	Course Level Standards-Competencies	Competency Statement
Finding Limits	• Associate the proper limit symbolism with a given graphical situation • Calculate limits of certain elementary functions • Define the concept of limit for real-valued functions of one real variable • Prove that a given limit statement is valid • Compute limits involving the trigonometric functions • Define and locate the vertical asymptotes of a function • Evaluate infinite limits of a function • Use limits at infinity to determine the end behavior of a function • Use the end behavior of a function to identify any horizontal or slant asymptotes	Students will be able establish the limit of a function and find vertical, horizontal, and slant asymptotes of a function.
Continuity	• State the conditions for the continuity of a function at a point • Define continuity on an open interval and on a closed interval • Identify intervals of continuity from a given graph • Determine points of discontinuity • Identify points of discontinuity as removable or non-removable • State and apply the Intermediate Value Theorem	Students will be able to determine the continuity of functions.

Basic Rules of Differentiation	• Define the derivative for real-valued functions of one real variable • Calculate the derivative of certain elementary functions directly from the definition • Calculate derivatives using the appropriate rules for sums, products, and quotients • State the connection between differentiability and continuity • Calculate higher order derivatives	Students will be able to apply the basic rules of differentiation

Differentiate Composite Functions	• Calculate derivatives using the chain rule • Compute derivatives by the method of implicit differentiation	Students will be able to differentiate composite functions.

Derivatives of Logarithmic and Exponential Functions	• Define the logarithm function in the natural base e • Demonstrate the basic properties of logarithms using the definition in 6.1 • Define logarithms in bases other than e. • Calculate derivatives of the logarithmic functions • Define the exponential function in the natural base e. • Define the exponential functions in based other than e	Students will be able to calculate derivatives of logarithmic and exponential functions.

Derivatives of Inverse Trigonometric Functions	• Determine whether a function is one to one • Define the inverse of a function • State the graphical relationship of inverse functions • Find the derivative of an inverse function a specified point • Define the inverse trigonometric functions • State the domain and range of the inverse trigonometric functions • Calculate derivatives of the inverse trigonometric functions • Calculate derivatives that are inverse trigonometric functions	Students will be able to find inverse functions, calculate inverse trigonometric functions, and find derivatives of inverse trig functions.

Analytical and Graphical Representations of Derivatives	• Define relative maximums and minimums of a function • Define and find critical values of a function • Find the relative extrama of a function using the first and second derivative tests • State and apply the Extreme Value Theorem • Define an increasing (and decreasing) function on an open interval • Use the first derivative to determine if a function is increasing (or decreasing) on an interval • Determine the open intervals on which a function is increasing and on which it is decreasing • Define concave up (and concave down) on an open interval • Use the second derivative to determine if a function is concave up (or concave down) on an interval • Determine the open intervals on which a function is concave up and on which it is concave down	Students will be able to use the derivative to identify extrema, increasing and decreasing functions, and the concavity of a function on an interval.
Using Derivatives	• Write models for real-world problems • Set up and solve applied min/max problems • Use the first and second derivative to graph certain elementary functions • State the geometrical significance of the first and second derivatives • State the physical significance for the first and second derivatives for rectilinear motion • State and apply the mean Value Theorem for derivatives • Set up and solve related rate problems	Students will be able to apply the derivative to real-world problems.
Definite Integrals	• Calculate Riemann sums in simple cases • State the First and Second Fundamental Theorems of Calculus • Apply the fundamental Theorem of calculus to evaluate definite integrals • Recognize and calculate anti-derivatives that are inverse trigonometric functions	Students will be able to calculate definite integrals.

	• Calculate anti-derivatives of the logarithmic functions • State the mean Value Theorem for integrals • Define the concept of the definite integral for real-valued functions of one real variable • Calculate the definite integral in simple cases directly from the definition	
Indefinite Integrals	• Calculate indefinite integrals for elementary functions • Use slope fields to estimate solutions to differential equations • Solve differential equations using separation of variables and anti-differentiation • Solve differential equations involving exponential growth or decay	Students will be able to calculate indefinite integrals and solve simple differential equations.
Applications of integrals	• Find the average value of a function on an interval • Connect position, velocity, and acceleration functions using integrals • Use accumulations functions and definite integrals in applied context • Find area between curves • Find volume using integrals	Students will be able to use integrals to solve a variety of applications.
Hyperbolic Trigonometric Functions	• Define the hyperbolic trigonometric functions • State the geometrical interpretations of the hyperbolic functions • Calculate derivatives and antiderivatives of the hyperbolic functions • Calculate derivatives and antiderivatives of the inverse hyperbolic functions	Students will be able to calculate hyperbolic trigonometric functions.