Mount Pleasant Central School District

AP Calculus AB, Math

We believe that students should learn the mathematical practice standards by showing the connections between real world problems and mathematical solutions by modeling, explorations and discovery.

How can we precisely and systematically describe and calculate quantities that are in continuous change? In this class, students will develop a deeper understanding of mathematical principles to investigate the concept of change. Our main goal is to develop a rich understanding of limits, derivatives, integrals, and the Fundamental Theorem of Calculus. We emphasize connecting mathematical concepts through multiple representations (graphical, numerical, analytical, and verbal), justifying reasoning and solutions, and using correct notation and language to communicate such solutions. Assessment will primarily be through summative assessments that model the AP exam, as well as performance-based assessments, such as projects that enable students to connect mathematical concepts.

Unit Title	Month	Content	Vocabulary	Standards	Skills	Big Ideas	Assessments
Limits and Continuity	September	*Evaluating limits using different modalities. *Determining if a function is continuous using the definition of continuity.	Limit Continuous Removable discontinuity Infinite discontinuity Jump discontinuity	Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. (CBAPAB-2.B)	Students will be able to evaluate limits given a graph, function, or table using a variety of methods. Students will be able to determine if a function is continuous and to identify types of discontinuities.	Limits describe the behavior of functions and underpin all of calculus.	In class, multiple choice and short answers. AP questions and formatting. (Half calculator, half without)
Geometric Interpretation of Derivatives	October	*Writing the equation of a tangent line and a normal line. *Using technology to support tangent line approximations.	Rate of change Instantaneous rate of change Tangent line Secant line Indeterminate expression	Identify an appropriate mathematical definition, theorem, or test to apply. (CBAPAB-3.B)	Students will be able to evaluate a limit using L'Hospital's rule. Students will be able to write the equation of a tangent line to a function, and use this to make a linear approximation.	Derivatives measure how quantities change instantaneously.	Take-home quiz (short answer).
Curve Sketching	October	*Using the first and second derivative tests to	Critical point Point of inflection	Provide reasons or rationales for solutions	Students will be able to conduct the first and	Derivatives reveal the structure and behavior of	In class, multiple-choice and short-answer

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		further analyze a function. *Determining behavior of original function based on first and second derivative graphs.	Concavity Extrema Increasing/decreasing	and conclusions. (CBAPAB-3.E)	second derivatives tests to analyze a function. Students will be able to make inferences about f given the graph of f' or f".	functions.	questions. AP questions and formatting. (Half calculator, half without)
Implicit Differentiation and Applications	November	*Finding first and second derivatives implicitly. *Applying results of implicit derivatives to write tangent lines and solve related rate word problems.	Related rate Constant Implicit Explicit Change	Apply appropriate mathematical rules or procedures, with and without technology. (CBAPAB-1.E)	Students will be able to find the first and second derivative of a relation implicitly. Students will be able to use the concept of implicit differentiation to solve related rates problems.	Differential equations describe patterns of change and accumulation.	In class, multiple choice and short answer questions. AP questions and formatting. (Half calculator, half without)
Straight Line Motion & Optimization	December	*Analyzing rectilinear motion problems. *Connecting calculus to kinematics such as first	Position Velocity Acceleration Displacement	Apply appropriate mathematical rules or procedures, with and without technology.	Students will be able to apply concepts of velocity, speed, acceleration, etc. to analyze straight line	Derivatives model real-world change and optimization.	Take home quiz, short answer. Project on optimization

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		and second derivatives equating to velocity and acceleration, respectively.	Optimization	(CBAPAB-1.E)	motion of an object. Students will be able to maximize or minimize a function through the process of optimization.		where students have to determine efficiency of wrapping paper using the process of optimization.
Integration	January	*Integrating functions using different methods to determine anti-derivative function. *Applying methods of integration to solve differential equations.	U-substitution, Anti-derivative Indefinite integral Definite integral Constant of integration	Identify a re-expression of mathematical information presented in a given representation. (CBAPAB-2.C)	Students will be able to take the integral of a variety of different functions using various methods (power rule, substitution, etc.). Students will be able to solve differential equations through separation of variables, and slope fields to determine the general solution and particular solution.	Integrals represent accumulated change over an interval.	Mid-unit quiz on integration techniques. End of unit exam. In class, multiple choice and short answer questions. AP questions and formatting. (Half calculator, half without)

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Integration Application - Area	February - April	*Calculating riemann sums to approximate the area under a curve. *Using the Fundamental Theorem of Calculus (parts 1 and 2) to calculate area.	Left riemann sum, right riemann sum, midpoint riemann sum, trapezoidal riemann sum,	Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. (CBAPAB-2.B)	Students will be able to compute a riemann sum for a given function to approximate the area under the curve. Students will be able to compute the area under a curve, between two curves, with and without the calculator.	Integration connects geometric ideas to physical quantities.	Mid Unit Project on Riemann Sums. Students drive a planned route. They approximate miles driven by conducting 4 riemann sums. Quiz (short answer) on area under the curve.
Integration Application - Volume	April - June	*Finding the volume of a solid of revolution using disk or washer methods. *Finding the volume of the solid generated by non-circular cross sections.	Disk method Washer method Cross-section Volume of revolution Average value	Apply an appropriate mathematical definition, theorem, or test. (CBAPAB-3.D)	Students will be able to apply the appropriate method (disk or washer) to find the volume of a solid of revolution. Students will be able to find the volume of a solid with a non-circular cross section.	Integration connects geometric ideas to physical quantities.	Take home quiz with multiple choice and short answer questions.

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