Mount Pleasant Central School District

Calculus, 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 all of their previous math courses while being able to make connections from those math courses to calculus. Students will be able to see the throughline from everything that they learned in algebra, geometry, trigonometry, and precalculus, and how it manifests itself in calculus. Our main goal is to develop an understanding of the pillars of calculus, which include understanding limits, continuity, derivatives, and integrals. 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 be a mix of summative assessments and group projects that focus on allowing students to have a deeper and longer-lasting connection with the material.

Unit Title	Month	Content	Vocabulary	Standards	Skills	Big Ideas	Assessments
Review- Domain, Functions	September	*Finding the domain and range graphically and algebraically. *Graphing polynomial functions, rational functions, and piecewise functions.	Domain Range Polynomial Rational Piecewise Function Asymptote Hole	Identify information from graphical, numerical, analytical, and verbal representations to answer a question or construct a model, with and without technology. (CBAPPC-2.A)	Students will exhibit foundational components of precalculus skills. Students will graph various types of functions and understand their key features.	The visual and algebraic connection between each type of function and its key components and features.	An exam with focused questions on skills and applications.
Limits	October	*Finding limits graphically, algebraically, and at infinity.	Limit Infinity Undefined “Does not exist.”	Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. (CBAPAB-2.B)	Students will connect previous learning about the domain to limits. Students will make connections between types of functions and their limits.	Understand what a limit is, how to find it, and how it relates to topics like “domain” and “continuity” of functions.	An exam with focused questions on skills and applications.
Continuity	October	*Define continuity. Find different types of discontinuities.	Continuity Removable Point Essential	Identify mathematical information from graphical, numerical, analytical, and/or verbal	Students will connect previous learning about domains and limits to continuity and the	Understand what it means to say a function is continuous and how to mathematically interpret	Students do an exploratory activity on “what is continuity”. There is also an exam

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			Infinite Jump/gap	representations. (CBAPAB-2.B)	different types.	the different types of discontinuities.	that focuses on skills and applications of continuity.
Derivative Rules	November	*What is a derivative, power rule, product rule, quotient rule, and the chain rule?	Derivative Slope of a tangent Rate of change Composition	Identify an appropriate mathematical definition, theorem, or test to apply. (CBAPAB-3.B)	Students will apply different derivative rules to different equations to solve problems.	Understand what a derivative is and where they occur in the real world and how to find them mathematically.	Stock market project to show derivatives in the real world. Exam that focuses on skills of the derivative.
Applications of the Derivative- Tangent lines and Motion	December	*Find the equation of tangent lines using the derivative. *Find solutions to motion problems using the derivative	Tangent lines Secant lines Projectile motion Particle motion Velocity Acceleration Position	Apply appropriate mathematical rules or procedures, with and without technology. (CBAPAB-1.E)	Students will show how the derivative can be used to find out about an object's velocity and acceleration.	Understand that derivatives represent a rate of change and that they can be used to model many different real world phenomena.	Students will do a “Pop Up toy” Lab. There is also an exam that focuses on skills and applications.
Applications of the derivative- Curve Sketching	January	*First derivative test Second derivative test Graphing	Increasing/decreasing functions Relative extrema Concavity Points of inflection	Provide reasons or rationales for solutions and conclusions. (CBAPAB-3.E)	Students will use the first and second derivatives to find out the shape of a function and then graph it.	The derivative will unlock a new way for us to explore functions and understand their shape.	Exam with focused questions on skill and application.

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			End behavior				
Multivariable Calculus	February	*Related Rates *Optimization *Implicit differentiation	Related rates Optimization Implicit	Apply appropriate mathematical rules or procedures, with and without technology. (CBAPAB-1.E)	Students will explain how multivariable functions change over time using derivatives.	Describe what happens when multiple variables influence a function and how it changes over time.	Group problem solving/ presentations. Exam with focused questions on skill and application.
Integration	March	*Integral *Antidifferentiation *Indefinite integrals *Initial value problems	Integral Indefinite Initial value	Identify a re-expression of mathematical information presented in a given representation. (CBAPAB-2.C)	Students will use antidifferentiation to solve problems from earlier in the year but in the other direction.	Understand that if we can derive a function then we should be able to integrate a derivative to get back an original function.	Group work/ problem solving. Exam with focused questions on skill and application.
Applications of the Integral	April - June	*Riemann sums *Fundamental Theorem of Calculus *Area under a curve	Riemann sums Fundamental Theorem of Calculus	Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. (CBAPAB-2.B)	Students will use geometry to approximate the area under a curve, and then use integrals to find the actual area under a curve and see how close we were.	We will see how to make a very accurate approximation of area under a curve, but then – using limits – we can describe the Fundamental Theorem of Calculus and find actual area (and	Students will solve a real world problem with a group and present it to the class. An exam will be given with focused questions on skill and application.

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						volume) of curves.	
		-	-		-		
		-	-		-		