Mount Pleasant Central School District

Pre-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 analyze and describe a wide variety of relationships using functions? In this class, students will develop a deeper understanding of families of functions that will prepare them for taking calculus, while also diving into some topics that relate to other branches of mathematics, such as matrices, sequences and series, and conic sections. Our main goal is for students to build upon their prior knowledge and expand their thinking on all of the different types of functions that they have encountered while in math classes. When students leave this class, they will be ready to take a college-level calculus course. 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- Factoring, Completing the Square, Quadratic Formula	September	Solving quadratics by factoring, completing the square, and the quadratic formula. Solving systems of equations with substitution and elimination	Factor, Trinomial, Binomial, System of Equations	Understand the concept of a function and use function notation. (AII-F.IF)	Solve quadratic functions using various methods. Solve systems of equations using elimination	Solving equations is an integral part of upper-level mathematics that all students need to be fluent with.	Cumulative exam with a focus on the most recent unit. The exam includes multiple-choice, free-response, and application questions.
Matrices	September	Operations with matrices Solving systems of equations using Matrices and Cramer's Rule	Matrix, Determinant, Inverse, Scalar, System	Express functions, equations, or expressions in analytically equivalent forms that are useful in a given mathematical or	Use matrices to organize and solve systems of linear equations Apply matrix operations to model and interpret real	Matrices provide a structured and efficient way to represent and solve complex relationships in mathematics and real-life contexts	Students will design and solve their own word problems based on data from local restaurants, interpreting their

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				applied context. (CBAPPC-1.B)	world problems		matrix in context. They will also complete a unit exam with multiple choice and free response questions to demonstrate conceptual understanding and accuracy
Functions	October	Algebraic Domain, Range, Asymptotes, Indeterminate Values, X-Intercept, Y-Intercept, Graphing	Function, Domain, Range, Interval Notation	Express functions, equations, or expressions in analytically equivalent forms that are useful	Determine the domain and range of a function from graphs, equations and real-world contexts.	Domain and range describe the possible inputs and outputs of a function, allowing us to understand the	Students will complete a short quiz to identify and represent the domain and range of functions

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Unit Title	Month	Content	Vocabulary	Standards	Skills	Big Ideas	Assessments
		Based on found information		in a given mathematical or applied context. (CBAPPC-1.B)	Communicate domain and range using appropriate notation and justify restrictions based on context	limits and behavior of a real-world relationship.	using graphs, equations and contextual examples.
Piecewise Function	October	Evaluating and writing piecewise functions, Graphing piecewise functions	Restrictive Domains, Continuity, Inclusive versus Exclusive, Step Function	Solve equations and inequalities represented analytically, with and without technology. (CBAPPC-1.A)	Write and interpret piecewise-defined functions to represent situations with different conditions or intervals Graph piecewise functions and analyze behavior, including continuity and domain restrictions	Piecewise functions model situations where relationships change based on conditions, helping us represent real world scenarios more accurately	Students will design a roller coaster model using piecewise functions to represent different segments of the track. They will also complete a unit assessment with multiple choice and open response

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							questions to demonstrate mastery of key concepts and skills.
Polynomial Division	November	Long Division, Synthetic Division, Remainder Theorem,	Divisor, Remainder, Synthetic Division, Quotient	Understand the relationship between zeros and factors of polynomials. (AII-A.APR)	Perform polynomial long and synthetic division to simplify expressions and identify factors. Analyze the relationship between polynomial division, factors and zeros of a function	Polynomial division helps reveal relationships between factors and zeros, building connections that deepen understanding of polynomial behavior	Cumulative exam with a focus on the most recent unit. The exam has multiple choice, free response questions, and application questions.
Polynomial Graphs	November	Root Behavior, End Behavior, Rational Root	Multiplicity, Zero/Root, End Behavior, Turning	Identify information	Analyze and graph	The structure of a	Cumulative exam with

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		Theorem	Point, Polynomial Function	from graphical, numerical, analytical, and verbal representations to answer a question or construct a model, with and without technology (CBAPPC-2.A)	polynomial functions identifying zeros, end behavior and turning points Interpret how coefficients and degree affect tee shape and behavior of a graph	polynomial function determines the shape of its graph and reveals important information about real-world patterns and behaviors.	a focus on the most recent unit. The exam has multiple choice, free response questions, and application questions.
Rational Functions and Graphing	December	Domain, Vertical and Horizontal Asymptotes, Holes/Indeterminates, Intercepts	Rational Function, Discontinuity/hole, Asymptote, Indeterminate, Undefined	Express functions, equations, or expressions in analytically equivalent forms that are useful in a given mathematical or applied context.	Simplify and analyze rational functions to determine key features such as asymptotes, intercepts and discontinuities Graph rational	Rational functions model relationships that include restrictions or asymptotic behavior, showing how division by zero and function structure influence a	Cumulative exam with a focus on the most recent unit. The exam has multiple choice, free response questions, and application questions.

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Unit Title	Month	Content	Vocabulary	Standards	Skills	Big Ideas	Assessments
				(CBAPPC-1.B)	functions and explain how their structure affect their overall behavior	graph's shape.	
Exponential and Logarithmic Functions	January	Exponent Rules, Solving Exponential Equations, Laws of Logs, Solving Log Equations, Solving Exponential Growth and Decay	Inverse, Exponential, Logarithmic, Rate of Growth, Rate of Decay	Analyze functions using different representations (AII-F.IF)	Model real-world situations using exponential and logarithmic functions. Solve exponential and logarithmic equations using properties of logarithms and technology	Exponential and logarithmic functions describe patterns of growth, decay and change, helping us model real world	Cumulative exam with a focus on the most recent unit. The exam has multiple choice, free response questions, and application questions.
Conics	February	Circles, Parabolas, Ellipses, Hyperbolas	Focus, Directrix, Axis of Symmetry, General Form, Major Axis, Minor	Identify information from graphical, numerical, analytical,	Model real world problems using conic sections.	Use conic functions to model and solve real world relationships	Cumulative exam with a focus on the most

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			Axis, Conjugate Axis, Transverse Axis, Eccentricity, Slant Asymptote	and verbal representations to answer a question or construct a model, with and without technology (CBAPPC-2.A)	Manipulate conic functions from general form to standard form	including planetary orbits, flashlight shapes, and tower construction.	recent unit. Exam has multiple choice, free response questions, application questions.
Trigonometric Functions	March	Unit Circle, Exact trig values, reference angles, reciprocal trig functions	Quadrants, Radian, Degree, Reciprocal, Sine, Cosine, Tangent, Cotangent, Cosecant, Secant	Describe the characteristics of a function with varying levels of precision, depending on the function representation and available mathematical tools (CBAPPC-3.A.)	Analyze trig functions and interpret different patterns that arise. Convert between degrees and radians	The structure of the trig functions determine what patterns we will see and how we can use that to make predictions.	Cumulative exam with a focus on the most recent unit. Exam has multiple choice, free response questions, application questions.

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Modeling and Graphing Trig Functions	April	Graphing trig functions, real world modeling of trig functions	Amplitude, Frequency, Period, Vertical Shift, Phase Shift, Midline	Model periodic phenomena with trigonometric functions (AII-F.TF)	Graph trig functions and explain how their structure affects the behavior of the graph. Use trig functions to model and explain real world phenomena	Trigonometric functions allow us to model real world problems that are cyclical such as changing tide, heart rhythms, medicinal properties, and more.	Students will create their own real world problem that models a trig function. Students will also take an exam that demonstrates their ability to work with and manipulate trig functions
Vectors	May	Law of Sines/Cosines Vector Algebra Applications of vectors Velocity and Force Vector Components	Vector, Velocity, Force, Components, Magnitude, Direction	Identify information from graphical, numerical, analytical, and verbal representations to	Use vectors to solve Law of Sines/ Cosines questions Use vectors to solve other real world	Vectors help model relationships in many real world scenarios including applications of velocity, force, and	Cumulative exam with a focus on the most recent unit. Exam has multiple choice, free response questions,

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				answer a question or construct a model, with and without technology (CBAPPC-2.A)	problems	speed.	application questions.
Sequences and Series	June	Analyzing arithmetic and geometric sequences and series	Arithmetic, Geometric, Divergent, Convergent,	Represent and evaluate the sum of a finite arithmetic or finite geometric series, using summation (sigma) notation. (AII-F.BF)	Determine if a series is arithmetic or geometric and find future values in the sequence Determine partial sums of sequences	Sequences describe patterns and progressions, while series represent accumulation.	Cumulative exam with a focus on the most recent unit. Exam has multiple choice, free response questions, application questions.