	ARTS IN MOTION CHARTER SCHOOL| 11th Grade Math III CURRICULUM MAP				
Projects	**Essential Questions**	**Enduring Understandings**	**Math Concepts**	**CCSS**	**Final Product**
Polynomial and Rational Functions	• How do changes in the symbolic representation of affect the graphical representation of the function? • What are the key features of a polynomial function and what do they mean in the context of a problem? • How do the properties of real numbers apply to imaginary numbers? • How can polynomial, radical, or rational, functions model problems? • Why are solutions considered "extraneous"? • How do they occur?	• Polynomial expressions are analogous to integers: they can be added, subtracted, multiplied, and divided by non-zero values; when they are divided the result may not be a polynomial • The zero-product property helps identify the roots of a polynomial, i.e. the x-intercepts of the function • The division of two polynomials results in rational expressions that are analogous to rational numbers • Rational equations can be solved using the properties of equality, though extraneous solutions sometimes emerge	• Analyze Functions • Expressions & Equations • Interpret Functions • Polynomial Expressions • Zeros of Polynomials	• CCSS.MATH.CONTENT.HSA.APR.B.2 • CCSS.MATH.CONTENT.HSA.APR.B.3 • CCSS.MATH.CONTENT.HSA.APR.D.6 • CCSS.MATH.CONTENT.HSA.APR.D.7 • CCSS.MATH.CONTENT.HSA.REI.A.2 • CCSS.MATH.CONTENT.HSA.SSE.A.1 • CCSS.MATH.CONTENT.HSA.SSE.A.2 • CCSS.MATH.CONTENT.HSF.IF.C.7 • CCSS.MATH.CONTENT.HSF.IF.C.8 • CCSS.MATH.CONTENT.HSF.IF.C.9	• Performance Task
Trigonometric Functions	• How can we model periodic behavior? • How do different ways of measuring angles compare?	• Some real-world patterns follow a periodic pattern • The unit circle can be used to expand trigonometry to angles greater than 90º Radians are an alternate way to measure angles, that directly connects to distance around the unit circle. • real-world situations that demonstrate periodic behavior.	• Periodic Phenomena • Trigonometric Functions	• CCSS.MATH.CONTENT.HSF.BF.B.3 • CCSS.MATH.CONTENT.HSF.IF.C.7 • CCSS.MATH.CONTENT.HSF.TF.A.1 • CCSS.MATH.CONTENT.HSF.TF.A.2 • CCSS.MATH.CONTENT.HSF.TF.A.3 • CCSS.MATH.CONTENT.HSF.TF.B.5	• Performance Task
Modeling Periodic Phenomena	• Periodic phenomena exist all around us. How can these phenomena be modeled with mathematics? • What are the benefits and limitations of using such models?	• The ability to synthesize and analyze patterns in the real-world is essential in understanding various phenomena. • Additionally it is an important skill to be able to apply a mathematical model in order to predict past and future outcomes. These types of skills will be used in various professions not limited to the medical field, science, engineering, economics, and more.	• Asking questions • Comparing/ Contrasting • Explanation of Evidence • Identifying Patterns and Relationships • Interpreting Data/Info • Making Connections & Inferences	• CCSS.MATH.CONTENT.HSF.BF.A.1 • CCSS.MATH.CONTENT.HSF.TF.B.5 • CCSS.MATH.PRACTICE.MP4	• Performance Task

			• Modeling • Multimedia in Oral Presentation		
Functions and Their Inverses	• How do we measure change and growth? • How are different representations of numbers related? • How are different representations of functions related? • How do we define relationships between functions?	• Exponential functions can be used to model real-life situations involving growth and decay • Frequency of compounding has an effect on the rate that exponentials grow and decay • Logarithm is the name for the operation that “undoes” exponentiation • Logarithmic functions and exponential functions are inverses	• Create Models • Exponents, Roots, & Logarithms	• CCSS.MATH.CONTENT.HSA.CED.A.1 • CCSS.MATH.CONTENT.HSA.CED.A.2 • CCSS.MATH.CONTENT.HSA.CED.A.3 • CCSS.MATH.CONTENT.HSA.CED.A.4 • CCSS.MATH.CONTENT.HSF.BF.A.1 • CCSS.MATH.CONTENT.HSF.BF.B.4 • CCSS.MATH.CONTENT.HSF.BF.B.5 • CCSS.MATH.CONTENT.HSF.IF.C.7 • CCSS.MATH.CONTENT.HSF.LE.A.4	• Performance Task

Inferences from Data	• How is variability in data best characterized? • How can we use samples to draw valid conclusions about a larger population? • How can we determine how unusual a particular event is?	• Randomness is the key to drawing larger conclusions from sampling. • Standard deviation is a useful measure of variability. • The normal distribution curve can be used to approximate how unusual a particular event is.	• Inferences from Data • Random Sampling • Univariate Data	• CCSS.MATH.CONTENT.HSS.IC.A.1 • CCSS.MATH.CONTENT.HSS.IC.A.2 • CCSS.MATH.CONTENT.HSS.IC.B.3 • CCSS.MATH.CONTENT.HSS.IC.B.4 • CCSS.MATH.CONTENT.HSS.IC.B.5 • CCSS.MATH.CONTENT.HSS.IC.B.6 • CCSS.MATH.CONTENT.HSS.ID.A.4	• Performance Task
Mathematical Modeling	• How can we model real-world phenomena that has ambiguity? • How can we use approximation and estimation strategically to model situations where facts are unknown? • What tools are most appropriate for use in modeling situations?	• Ambiguous situations can necessitate making assumptions in order to model; exploring multiple sets of assumptions is often beneficial • All models are wrong; some are useful. Mathematical modeling is about minimizing error; doing so is often an iterative process.	• Analyze Functions • Create Models • Create from Existing Functions • Interpret Functions • Modeling with Geometry	• CCSS.MATH.CONTENT.HSF.IF.B.4 • CCSS.MATH.CONTENT.HSF.IF.B.5 • CCSS.MATH.CONTENT.HSF.IF.B.6 • CCSS.MATH.CONTENT.HSG.MG.A.1 • CCSS.MATH.CONTENT.HSG.MG.A.2 • CCSS.MATH.CONTENT.HSG.MG.A.3 • CCSS.MATH.PRACTICE.MP4 • CCSS.MATH.PRACTICE.MP6	• Speeding Tickets
Modeling College Tuition	• How can we use mathematics to predict college tuition in the future? • How can we then use statistics to help us gain a deeper picture of what is going on in the data and use that to compare and contrast schools of interest to school in the United States?	• College tuition rates change from year to year. • Understanding and analyzing the historical trends in college tuition rates is important in predicting the cost of college in the future.	• Comparing/ Contrasting • Conventions • Explanation of Evidence • Introduction and Conclusion • Making Connections & Inferences • Modeling • Multimedia in Written Production • Organization (Transitions, Cohesion, Structure) • Style and Language (Tone, Academic Language, Syntax)	• CCSS.MATH.CONTENT.HSS.ID.B.6 • CCSS.MATH.PRACTICE.MP4	• Performance Task

ARTS IN MOTION CHARTER SCHOOL| 11th Grade Math III UNIT PLAN	
Project	Polynomial and Rational Functions
Suggested Time	● 4 Weeks
Essential Questions	● How do changes in the symbolic representation of affect the graphical representation of the function? ● What are the key features of a polynomial function and what do they mean in the context of a problem? ● How do the properties of real numbers apply to imaginary numbers? ● How can polynomial, radical, or rational, functions model problems? ● Why are solutions considered “extraneous”? ● How do they occur?
Enduring Understandings	● Polynomial expressions are analogous to integers: they can be added, subtracted, multiplied, and divided by non-zero values; when they are divided the result may not be a polynomial ● The zero-product property helps identify the roots of a polynomial, i.e. the x-intercepts of the function ● The division of two polynomials results in rational expressions that are analogous to rational numbers ● Rational equations can be solved using the properties of equality, though extraneous solutions sometimes emerge
Math Concepts	● Analyze Functions ● Expressions & Equations ● Interpret Functions ● Polynomial Expressions ● Zeros of Polynomials
Focus Areas	● Polynomial Operations ● Graphs of Polynomial Functions ● Domain of Radical and Rational Functions

	• Rational and Radical Equations
CCSS	• CCSS.MATH.CONTENT.HSA.APR.B.2 • CCSS.MATH.CONTENT.HSA.APR.B.3 • CCSS.MATH.CONTENT.HSA.APR.D.6 • CCSS.MATH.CONTENT.HSA.APR.D.7 • CCSS.MATH.CONTENT.HSA.REI.A.2 • CCSS.MATH.CONTENT.HSA.SSE.A.1 • CCSS.MATH.CONTENT.HSA.SSE.A.2 • CCSS.MATH.CONTENT.HSF.IF.C.7 • CCSS.MATH.CONTENT.HSF.IF.C.8 • CCSS.MATH.CONTENT.HSF.IF.C.9
Checkpoints	• Properties of Polynomials • Graphing Polynomials • Rational Expressions and Equations • Rational Functions
Final Product	• Performance Task

ARTS IN MOTION CHARTER SCHOOL| 11th Grade Math III LESSON PLAN					
Project	Polynomial and Rational Functions	**Essential Questions**	• How do changes in the symbolic representation of affect the graphical representation of the function? • What are the key features of a polynomial function and what do they mean in the context of a problem? • How do the properties of real numbers apply to imaginary numbers? • How can polynomial, radical, or rational, functions model problems? • Why are solutions considered “extraneous”?	**Final Product**	• Performance Task

			• How do they occur?		

Checkpoint	• Properties of Polynomials
Cognitive Skills	• Polynomial Expressions
Objective	• Students will be able to identify properties of polynomial expressions.
Activities	• Checkpoint
Resources	• Scott's Macho March Madness
Assessment	• Performance task assessment using cognitive skills (See attached Sample)

Checkpoint - Properties of Polynomials

1. Perform the operations with polynomials:

$(3x^3 - x^2 + 8) - (x^3 + 5x^2 + 4x - 7)$ $(x^2 - x + 1)(x - 1)$

2. Celina says that each of the following expressions is actually a binomial in disguise:
   i) $5abc - 2a^2 + 6abc$
   ii) $5x^3 \cdot 2x^2 - 10x^4 + 3x^5 + 3x \cdot (-2)x^4$
   iii) $(t + 2)^2 - 4t$
   iv) $5(a - 1) - 10(a - 1) + 100(a - 1)$

   For example, she sees that the expression in (i) is algebraically equivalent to $11abc - 2a^2$, which is indeed a binomial. Is she right about the remaining three expressions? Justify your responses.

3. Janie writes a polynomial expression using only one variable, x, with degree 3. Max writes a polynomial expression using only one variable, x, with degree 7.
   a. What can you determine about the degree of the ***sum*** of Janie's and Max's polynomials?

   b. What can you determine about the degree of the ***difference*** of Janie's and Max's polynomials?

4. Janie writes a polynomial expression using only one variable, x, with degree 5. Max writes a polynomial expression using only one variable, x, with degree 5.
   a. What can you determine about the degree of the sum of Janie's and Max's polynomials?

   b. What can you determine about the degree of the difference of Janie's and Max's polynomials?