# **Unit 03: Polynomials & Optimization**

Content Area:	Mathematics
Course(s):	PreCalc Trig H
Time Period:	Semester 1
Length:	2 weeks
Status:	Published

## Standards - NJCCS/CCSS

CCSS.Math.Content.HSF-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
CCSS.Math.Content.HSN-CN.A	Perform arithmetic operations with complex numbers.
CCSS.Math.Content.HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
CCSS.Math.Content.HSN-CN.A.1	Know there is a complex number $i$ such that $i^2 = -1$ , and every complex number has the form $a + bi$ with $a$ and $b$ real.
CCSS.Math.Content.HSF-IF.C.7.a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
CCSS.Math.Content.HSN-CN.A.2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
CCSS.Math.Content.HSN-CN.A.3	Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
CCSS.Math.Content.HSF-IF.C.7.c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
CCSS.Math.Content.HSN-CN.C.7	Solve quadratic equations with real coefficients that have complex solutions.
CCSS.Math.Content.HSN-CN.C.8	Extend polynomial identities to the complex numbers.
CCSS.Math.Content.HSN-CN.C.9	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

### **Enduring Understandings**

The symbolic language of algebra and generalization of patterns in mathematics are used to communicate and understand mathematics.

Coordinate geometry can be used to represent and verify geometric/algebraic relationships.

Optimization is finding the best solution within given constraints.

### **Essential Questions**

What do the zeros of a polynomial represent? How does the value of a function compare to the remainder when the function is divided? How do you find the minimum of a function? How do you find the maximum of a function? How many positive zeros does a polynomial have? How many negative zeros does a polynomial have?

### Knowledge and Skills

SWBAT differentiate between even and odd degree polynomials.

- SWBAT quickly sketch polynomials.
- SWBAT divide polynomials by the division algorithm.
- SWBAT use synthetic division.
- SWBAT demonstrate understanding of the use of the factor theorem and remainder theorem.
- SWBAT use the rational root theorem to find zeros.
- SWBAT use the complex zero theorem to find the zeros of a polynomial.
- SWBAT solve optimization problems.
- SWBAT apply Descartes' Rule of Signs.
- SWBAT apply the complex root theorem.

#### Resources

Precalculus with Limits

Authors: Aufmann, Barker, Nation

Graphing Calculator

www.desmos.com

www.flipgrid.com

www.graphfree.com