UNIT 3: Polynomial and Rational Functions

Objectives: Upon completion of the unit, students will be able to:

- Complete the square to write a quadratic in standard form
- Determine maximum and minimum values of a polynomial
- Determine intervals of increase and decrease in a polynomial function
- Solve a quadratic equation
- Divide a polynomial into another to determine remainder of a function or factor of a function
- Factor a polynomial
- Find all zeros of a polynomial (real, complex, rational, irrational, etc.)
- Simplify complex numbers using various algebraic techniques
- Use the graphing calculator to SUPPLEMENT your algebraic work throughout the chapter
- Identify and prove lower and upper bound of a polynomial or graph
- Use Descartes Rule of Signs to determine how many positive or negative zeros are possible
- Graph rational function
- Find asymptotes (VA, HA, SA), intercepts and/or holes of rational functions

Video Lectures	Video Examples	Section from Text (WebAssign)
1a. Completing the Square 1b. Graphing Quadratics in Standard Form 1c. Application – time versus position 1d. Increasing/Decreasing Example 1e. Find max or min of quadratic	1a. Leading coefficient not 1 – Complete the Square 1b. Deriving the Quadratic Formula 1c. Write then graph a Quadratic in Standard Form 1d. Write equation of quadratic given graph 1e. Quadratic Inequality	3.1
2a. Turning Points and X-Intercepts 2b. End Behavior of Polynomials	2a. Find intercepts (not labeled x and y), factorable 2b. Find x and y intercepts given polynomial factored	3.2
3a. Long Division 3b. Synthetic Division 3c. Use synthetic division to find value of f(x) 3d. Remainder Theorem	3a. Dividing using Long division – fraction answers 3b. Example with synthetic division	3.3
4a. Rational Roots Test 4b. Find integer roots of polynomial 4c. Find rational roots of polynomial (synthetic division then factor) 4d. Descartes Rule of Signs 4e. Find polynomial given fractional roots	4a. Find rational zeros using TI-84 calculator 4b. Find rational and irrational roots of cubic polynomial 4c. Upper and Lower Bounds Theorem	3.4
5a. Complex Numbers 5b. Complex Number Operations 5c. Raising imaginary unit i to a power	5a. Simplify, Add and Subtract Complex Numbers 5b. Multiply and Simplify Complex Numbers 5c. Multiply Complex Conjugates 5d. Dividing Complex Numbers	3.5

6a. Find zeros of polynomial function 6b. Ex: Find polynomial function given zeros 6b. Find zeros given one (power of 5)	6a. Find zeros of a polynomial function 6b. Find polynomial function given zeros 6c. Find polynomial given roots	3.6
7a. Graph Rational Functions 7b. Determine HA and VA of rational functions 7c. Determine Slant Asymptote of rational function 7d. Graphing Rational Functions 7e. Match Equations with Graphs (General forms)	7a. Find asymptotes and graph rational function 7b. Find intercepts, asymptotes, and hole of rational function 7c. Graphing Rational Function (HA, VA) 7d. Determine Asymptotes (SA also) and graph	3.7