

PreCalculus – Key Objectives | Polynomial Functions

This Polynomial Functions Unit will encompass 2 MAJOR concepts – both of which were presented in the prerequisite Integrated Math 3 course. These MAJOR concepts are: (1) Characteristics of Polynomial Functions and (2) Algebraic Working with Polynomial Functions. Both of these major concepts will be continually revisited in later units in the course as well as in subsequent courses, so it is important to understand these concepts and master the required skills.

(1) Basic Characteristics of Polynomial Functions

What you should KNOW	What you should be able to DO
<ul style="list-style-type: none">- terminology related to describing polynomial functions- how the shape of a polynomial changes as the degree of the polynomial increases- the general appearance of polynomials of even and odd degree- the general appearance of polynomials given the sign of the leading coefficient (Leading Coefficient Test)- the end behaviors of any polynomial, given the degree and leading coefficient- define multiplicity of roots & connect it to the appearance of polynomials near the x-axis- the connection between roots and factors (as per the Factor Theorem)	<ul style="list-style-type: none">- use appropriate terminology to describe the characteristics of polynomials- graph power functions $f(x) = x^n$, where $n \in \mathbb{Z} n > 0$ in the interval $\{x \in \mathbb{R} -1 < x < 1\}$ as well as the interval of $\{x \in \mathbb{R} -5 < x < 5\}$- describe short term & long term behavior and sketch graphs of polynomial functions, given information about the sign of the leading coefficient & the order of the polynomial- explain/describe and sketch the behavior of polynomial functions around the x-axis (say with a y-window setting from $y = -2$ to $y = 2$)- state the roots of a polynomial given its factors and vice versa, state the factors of a polynomial given its roots- write an equivalent expression for a polynomial in standard form using only linear and/or irreducible quadratic factors

(2) Algebraic Working with Polynomial Functions

What you should KNOW	What you should be able to DO
<ul style="list-style-type: none">- how long division & synthetic division with polynomials helps in determining roots of polynomials- limitations in the synthetic division process- theorems related to polynomial functions (Remainder Theorem, Rational Root Theorem)- how number systems can be “expanded” to help solve equations like $x^2 = -1$ (the complex number system)- understand that complex roots always exist in conjugate pairs- state the Fundamental Theorem of Algebra	<ul style="list-style-type: none">- perform long and synthetic division to determine factors & roots of polynomials & remainders in divisions- calculate the remainder when a polynomial function is divided by a linear factor without using long or synthetic division- predict the possible roots of a polynomial function, given its leading coefficient and its constant term (rational root theorem)- solve quadratic equations for complex roots- write a quadratic as a product of linear factors, using both real and complex numbers- solve for all real zeroes of a third or fourth degree polynomial using algebra (using polynomial theorems), using graphs & using technology.- solve for all complex zeroes of a third or fourth degree polynomial using algebra (using polynomial theorems), using graphs & using technology.- write a polynomial as a product of linear factors, using both real and complex numbers