

**Unit 5 – Polynomial & Rational Functions: BIG PICTURE:**

(1) Once a foundational concept is understood, we can develop new knowledge and new ideas as we extend the foundational concept by simply asking "what if ..." or "what about ...." or "how would things change if .... " Any topic in math can be EXTENDED as new ideas/skills/process get introduced or get applied. We will demonstrate this EXTENSION in our study of Polynomial Functions.

i.e. how does a graph/function change if another linear factor is included ==> i.e. how does  $(x+2)(x+3)$  compare to  $(x+2)(x+3)(x+4)$ ? Why?

(2) Any topic in math can be CONNECTED to previously taught ideas/skills/processes. We will demonstrate this CONNECTION in our study of Polynomial Functions.

i.e. how does our mastery of skills associated with quadratic algebra help us to algebraically analyze/work with polynomial & rational functions.

(3) How can use the equation of a polynomial function to PREDICT the key features of a polynomial without the benefit of a graph

i.e. end behavior, multiplicity of roots, optimal points, intervals of increase/decrease. In other words, what algebra  $\leftrightarrow$  graph connections are there?

**Polynomial/Rational Function Basics:**

1. be able to use new terminology related to polynomial & rational functions: leading coefficient, degree of polynomial, end behaviour, extrema, names of special polynomials, asymptotes, discontinuities, linear factor, intervals of increase/decrease
2. be able to evaluate polynomial and rational functions
3. Be able to work through contextual data using (a) regressions given a set of data & (b) determining and interpreting the  $r^2$  value to test the accuracy of your model
4. Be able to graph and analyze polynomial/rational functions effectively using the TI-84

**Polynomial/Rational Functions from a Graphic Perspective:**

5. Be able to work from a graph to an equation & determine: (a) Leading Coefficient & its sign, (b) Degree, (c) Constant & (d) Multiplicity of its roots

## Unit Objectives | Polynomial & Rational Functions Unit

6. Be able to work from a factored equation of a polynomial to a graph (and also vice versa) and hence determine:  
(a) Leading Coefficient & its sign, (b) Degree, (c) Constant & (d) Multiplicity of its roots
7. Be able to sketch and analyze graphs of rational functions in the form of Linear/Linear and also in the (transformational) form of  $a/(x-c) + d$
8. Be able to apply polynomial/rational functions to modeling scenarios when presented with the graph of the function in context

### **Polynomial/Rational Functions from an Algebraic Perspective:**

9. Be able to perform simple polynomial operations ( + - x / )
10. Be able to perform synthetic division and understand its role in factoring polynomials
11. Be able to fully factor cubics or quartics using synthetic division & fundamental quadratic algebra skills
12. Be able to fully factor cubics or quartics given a graph of the function
13. Be able to perform quadratic factoring as it relates to higher order polynomials
14. Be able to solve quadratics with the quadratic formula as it relates to higher order polynomials
15. Be able to solve polynomial equations & inequalities w/ GDC
16. Be able to understand the connection between a graph and its factored equation
  
17. Be able to apply polynomial/rational functions to modeling scenarios when presented with the equation of the function in context
18. Connect function concepts of notation, inverses, transformations to polynomial and rational functions