

## Introduction to Polynomial Functions

**General Outcome:** Develop algebraic and graphical reasoning through the study of relations.

**SO 7: Represent data, using polynomial functions (of degree  $\leq 3$ ), to solve problems. [C, CN, PS, V, T]**

- 7.1. Describe, orally and in written form, the characteristics of a polynomial function by analyzing its graph.
- 7.2. Describe, orally and in written form, the characteristics of a polynomial function by analyzing its equation.
- 7.3. Match equations in a given set to their corresponding graphs.
- 7.4. Graph data, and determine the polynomial function that best approximates the data.
- 7.5. Interpret the graph of a polynomial function that models a situation, and explain the reasoning.
- 7.6. Solve, using technology, a contextual problem that involves data that is best represented by graphs of polynomial functions, and explain the reasoning.

### Mathematical Processes

- **Communications [C]**
- **Connections [CN]** Students are expected to make *connections* among mathematical ideas, other concepts in mathematics, everyday experiences and other disciplines
- **Problem Solving [PS]** Students are expected to develop and apply new mathematical knowledge through *problem solving*
- **Visualization [V]** Students are expected to develop *visualization* skills to assist in processing information, making connections and solving problems.
- **Technology [T]** Students are expected to select and use technology as a tool for learning and for solving problems

### Polynomials -- Real Life Applications

#### Connection:

1. Organize students into groups of two. Have students search for data about sports, economics, science, or other topics of interest. Direct them to enter portions of the data on a graphing calculator to see if the data can be modeled in a reasonable way by a linear, quadratic, or cubic polynomial function. Students then record the equations for the models and sketch graphs of the data points and models. Have students classify their models by degree and number of terms.

# Exploring the Graphs of Polynomial Functions

## Achievement Indicators:

7.1. Describe, orally and in written form, the characteristics of a polynomial function by analyzing its graph.

## Lesson Links:

- [Click here](#) for a Notebook version of ERLC Lesson Link. Please use this lesson as a framework for your own teaching environment.
- [Click here](#) for a pdf version of the same ERLC Lesson Link.

## Videos:

- General video for this lesson ([Youtube Link](#))

## Discovery Based Learning Ideas:

1. **MATHLab** (Ketsa) -- [Click here](#)
2. **Algebra 2: Exploring Polynomials: Factors, Roots, and Zeros** (Nspired Math Classroom) -- [Click here](#)
3. **Communication Idea:**  
Have students associate the name of each polynomial with its degree. For example, a monomial relates to a monologue, or speech by one person; and a quartic relates to a quartet, or singing group with four people.  
  
Advanced Learners: Challenge students to explain why quad, meaning four, is the prefix in the word quadratic that describes a second-degree polynomial.
4. **Technology Activity Graphs of Polynomial Functions** (Ketsa) -- [Click here](#) for Word Document and [Click here](#) for pdf copy of the activity
5. [Polynomial Function Investigation](#) -- Barry
6. [Building Connections](#) - Illuminations  
This lesson focuses on having students make connections among different classes of polynomial functions by exploring the graphs of the functions. The questions in the activity sheets allow students to make connections between the x-intercepts of the graph of a polynomial and the polynomial's factors. This activity is designed for students who already have a strong understanding of linear functions, some knowledge of quadratic functions, and what is meant by a polynomial function.

# Characteristics of the Equations of Polynomial Functions

## Achievement Indicators:

- 7.2. Describe, orally and in written form, the characteristics of a polynomial function by analyzing its equation.
- 7.3. Match equations in a given set to their corresponding graphs.

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## Videos:

- Characteristics of the Equations of Polynomial Functions -- ([Youtube Link](#))

## Assessment For Learning

### Games:

1. [Polynomial Match Up](#) -- Barry

### Open Ended Questions:

1. Write a third-degree polynomial function. Make a table of values and a graph. Find the x- and y-intercepts.
2. Write a polynomial function with the following features: it has three distinct zeros; one of the zeros is 1; and it opens from lower right to upper left.

### Communication:

1. Explain how to describe the graph of a polynomial function.
2. A cubic function of degree 3 can have three zeros. Explain how to use this fact to graph the function.
3. Explain why cubic functions are useful for interpolating between known data points. Why are they often not reliable for extrapolating data?

## Modelling Data with a Line of Best Fit

### Achievement Indicators:

- 7.4. Graph data, and determine the polynomial function that best approximates the data.
- 7.5. Interpret the graph of a polynomial function that models a situation, and explain the reasoning.
- 7.6. Solve, using technology, a contextual problem that involves data that is best represented by graphs of polynomial functions, and explain the reasoning.

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- [Click here](#) for a pdf version of the same ERLC Lesson Link.

### Videos:

- [Modelling Data with a Line of Best Fit](#)

## Modelling Data with a Curve of Best Fit

### Achievement Indicators:

- 7.4. Graph data, and determine the polynomial function that best approximates the data.
- 7.5. Interpret the graph of a polynomial function that models a situation, and explain the reasoning.
- 7.6. Solve, using technology, a contextual problem that involves data that is best represented by graphs of polynomial functions, and explain the reasoning.

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- [Click here](#) for a pdf version of the same ERLC Lesson Link.

### Videos:

- [Modelling Data with a Curve of Best Fit](#)

## Assessment For Learning

### Hands On Investigation:

1. Drop Lab Lab -- [Teacher Notes](#) | [Student Worksheet](#)
2. Holey Cub Lab -- [Teacher Notes](#) | [Student Worksheet](#)