

CURRIKI ALGEBRA UNIT 5
Lesson 5.4 Analyze Functions by Graphing
Quadratic Functions and Modeling

Unit 5 Quadratic Functions and Modeling

The first eight lessons (5.1-5.8) provide the instruction and practice that supports the culminating activity in the final unit project.

Lesson 5.4

In this lesson, students continue to work on their graphing skills, by hand in simple cases and using technology for more complicated cases, to identify key features including intercepts, maxima, and minima. Graphs will include linear, quadratic, square root, cube root, and piecewise-defined functions, and possibly step functions and absolute value functions. The focus will be on identifying the type of function by comparing the graphical representations.

Common Core State Standards by Cluster:

Grade Level	Cluster	CCS Standard
9	Analyze functions using different representations	F.IF.7b

Lesson Preparation and Resources for Teachers:

[Graphing a Linear Equation and Linear Inequality](#) (WinPossible video – step-by-step instructions)

[Family of Functions](#) (Exploring 6 Families of Functions)

[Linear Function Graphs](#) (Sal Kahn video – good review of functions)

[Graphing Linear Equations by using a table](#) (video = step-by-step instructions)

[The Quadratic Formula](#) – Interactive Lesson and homework

[Lesson 22: Functions as Models](#) Includes absolute value

[Calculate Absolute Value](#) Describes the absolute value function

[Radical Equations](#) Interactive lesson and homework

[Special Functions](#) (Sal Kahn video)

[Teaching Linear Equations Through Running a Business](#)

TE_5.4 Vocabulary Page

TE_5.4 Investigating the Parabola in Vertex form

TE_5.4 Rigid Transformations answer Key

Instructional Materials for Students (print one copy for each student)

SE_5.4 Vocabulary Page

SE_TE 5.4 The Vertex (answers are within document)

[Special Functions](#)

SE_5.4 [Investigating the Parabola in Vertex Form](#) (answers are within document)

[XBOX Exponential](#)

SE_5.4 [Rigid Transformations](#)

[Hotmath Practice Problems](#)

Time: 50-minute lesson

Lesson Objectives:

Students will:

- Graph linear and quadratic functions
- Graph square root, cube root and piecewise-defined functions
- Identify intercepts, maxima, minima
- Factor functions (including completing the square)

Lesson Content

1. Background building Activity for Students (5 minutes)

a. Vocabulary Building

Provide students with Vocabulary Page. Students should create their own definition of the terms, and include a picture or example for each.

b. Warm-up Problem

Ask students to graph the following equation: $-3x + y = 2$. The video [Graphing Linear Equations by using a table](#), shows a possible solution. Discuss the solutions as a class. Have students share ideas about the graph. What method was used to graph the function? What kind of function is this? What are the characteristics of this type of function?

2. Focus Question based on Today's lesson (25 minutes)

Today's focus question (write it on the board):

How do the graphs of linear, absolute value, quadratic, cubic, radical, or rational functions types differ?

a. **Whole group activity:** The function in the warm-up was a linear function. The graph of a linear function is a straight line. The equation for a linear function takes on the form: $y = mx + b$. Explain to the class that functions may also be absolute value functions, quadratic functions, cubic functions, radical functions and rational functions. Each function type will have different looks when graphed as well as different equations to represent them.

b. **Small Group Activity** (teacher observes students while they work to check understanding.) Divide the class into six small, heterogeneous groups. Assign each group one of the following function types:

- Absolute value
- Quadratic
- Cubic
- Radical

- Rational
- Linear (if the class is large, a 6th group is needed)

Each group will create a poster, Glogster, PowerPoint, teaching video or other media resource to share a graph of each function type and the related equation. The goal of this activity is to identify and recognize key features in each of the function types (for example: linear functions are in the form $y = mx + b$, and the graph is a straight line; whereas, quadratic functions have the form $ax^2 + bx + c$ and the graph is a parabola). Additional lessons that focus separately on each of the function types would be required for mastery. Each of these function types will have unique characteristics that students should learn to recognize.

Students may use their textbooks, the following resources, or other information sources to create their final product:

- ii) [Lesson 22: Functions as Models](#)
- iii) [Calculating Absolute Value](#)
- iv) [Quadratic Formula](#)
- v) [Radical Equations](#)
- vi) [Rational Equations](#)

- c. **Individual Activity:** Provide each student with the homework worksheets. The homework may be adjusted for student ability (scaffolding) by assigning only the odds (or even) numbered problems.

3. Whole Class Discussion

Students share their solutions to the problems with a classmate. Students should help each other identify misconceptions and locate errors in thinking. Discuss as a class ways used to identify the function type. Allow students the chance to share their solutions with the class to help solidify their understanding of the topic. Students should ask questions in preparation for the upcoming assessment.

4. Assessment Activity (5 minutes)

Using graphing calculators, ask students to graph the equations found at [Hotmath Practice Problems](#) and identify each function type by its unique graph. This link can also be reached using [Graphing Calculators](#), Algebra: Chapter 9.

5. Extension Activities

[XBOX Exponential:](#)

In 1965 Gordon Moore, computer scientist and Intel co-founder, predicted that computer processor speeds would double every two years. Twelve years later the first modern video game console—the Atari 2600—was released. In this lesson, exponential growth is used to find out whether Moore’s prediction—which we’ll call Moore’s Law—has applied to video game consoles. . . and what this means for the future of humanity.

[Teaching Linear Equations Through Running a Business](#)

This is an 8-week unit of instruction for an Algebra I course that covers all the generally required material for the topics of graphing linear equations, solving systems of linear equations, simple linear regression, and applying systems of linear equations to real-life situations. Go to the Curriki site and download the files for this unit. The unit is constructed using a Project-Based Learning approach, where the students work collaboratively to run a class business during the 8 weeks. As they move through the various stages of planning and executing the business, they learn various concepts related to linear equations and how they directly apply to predicting demand or cost/revenue information. Finally, the project incorporates technology education by having the students use Microsoft Excel and PowerPoint to report and analyze the sales results of their business.

SE_5.8 [Rigid Transformations](#)

After investigating the different types of functions, students can investigate horizontal and vertical shifts in quadratic, cubic, square root, and absolute value functions

6. Homework assignment for additional independent practice

SE_TE 5.4 [The Vertex](#) – This lesson contains homework problems that can be assigned for extra practice (answers are within the document).

[Special Functions](#) (Sal Kahn video) – These video lessons go over California Standards Test in Algebra II. Students can try to answer the question before seeing the solution. This is a great way to check for understanding.

SE_TE 5.4 [Investigating the Parabola in Vertex Form](#) – We suggest assigning pages 9 & 10 for homework (answers are within the document).