10-Graphing Non-Linear Functions

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **2 weeks (8-10 blocks)**
Status: **Published**

General Overview, Course Description or Course Philosophy

This final unit looks back on and expands topics covered throughout the course, especially function tables, graphs, and equations. Students will compare the characteristics of various functions and identify real-world situations in which each can be used.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Non-linear functions can be used to solve a problem or predict an outcome
- Functions are a mathematical way to describe relationships between two quantities that vary

Essential Questions:

- How can you recognize various functions (linear, exponential, quadratic) from a table? A graph? An equation?
- How can you describe a non-linear change from a graph?
- Give an example of a real-world situation that can be represented using a non-linear function. Explain.

CONTENT AREA STANDARDS

MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
MA.F-IF.C.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.F-LE.A.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
MA.F-LE.A.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
MA.F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

MA.A-REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Key characteristics of non-linear functions are vertex, zeros, intercepts, domain, range, maximum/minimum, and opening direction
- Linear functions have a constant first difference
- Quadratic functions have a constant second difference
- Exponential functions have a multiplicative relationship

Procedural Knowledge

Students will be able to:

- Categorize and graph exponential growth and decay
- Identify and graph inverse variations
- Identify and graph quadratic equations in two-variables
- Use first and second difference to determine type of function
- Compare functions using equations, tables, and graphs

EVIDENCE OF LEARNING

Formative Assessments

- Class Discussion/Exit Cards
- Homework/practice problems (assigned from textbook or various web resources, such as Khan Academy, Albert, Quizizz, or Desmos)

Summative Assessments

- Lesson quizzes
- Teacher-generated unit test
- Performance tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

- *Algebra 1: Common Core*, Sections 4-1, 4-3, 11-6, & 11-7
- Illustrative Math Tasks
- Arlington Algebra Project (A Final Look at Functions)

INTERDISCIPLINARY CONNECTIONS

Students can write equations or functions to model real-world systems, for example, acceleration due to gravity and projectile motion.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.