MP3b-Quadratic Functions

Content Area: **Math**
Course(s): **Algebra 1 Accelerated**
Time Period: **Marking Period 3**
Length: **enVision Chapter 8, 13 days**
Status: **Published**

Essential Questions

- How can you use sketches and equations of quadratic functions to model situations and make predictions?

Big Ideas

- Identify and graph quadratic functions.
- Transform quadratic functions.
- Use various methods to solve quadratic equations, systems with one linear and one quadratic equation, and nonlinear systems.

CSDT Technology Integration

8.1.8.AP.2 : Create programs that use clearly named variables to store and modify data.

Activity:
Students complete the interactive lab activity, "Quadratic Functions- Desmos- Will it Hit the Hoop?" independently during station rotation. The lab challenges students to take knowledge of how a basketball is shot and transfer it to the terms in a quadratic formula. At the end, students are able to view other responses from classmates, and hold a classroom discussion on the methods and strategies used to successfully complete the lab through a shared Google Doc.

Enduring Understandings

Interpreting Functions

F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that

use function notation in terms of a context.

F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F.IF.C7a Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.IF.C7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

- Identifying Quadratic Functions
- Characteristics of Quadratic Functions
- Graphing Quadratic Functions

F.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. 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. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)t$, $y = (0.97)t$, $y = (1.01)12t$, $y = (1.2)t/10$, and classify them as representing exponential growth or decay.

F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Building Functions

F.BF.A1 Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. c. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.

F.BF.B3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- Transforming Quadratic Functions

Interpreting Categorical & Quantitative Data

S.ID.B6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. b. Informally assess the fit of a function by plotting and analyzing

residuals, including with the use of technology.

Linear, Quadratic, & Exponential Models

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.

Reasoning with Equations & Inequalities

A.REI.D10 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).

- Identifying Linear Functions

Creating Equations

A.CED.A2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Mathematical Practices Focus

1. Make sense of problems and persevere in solving them. Pages 329, 344

2. Reason abstractly and quantitatively. Pages 315, 344

3. Construct viable arguments and critique the reasoning of others. Pages 315, 329

4. Model with mathematics. Pages 322, 336, 343

5. Use appropriate tools strategically. Pages 336

6. Attend to precision. Pages 322

7. Look for and make use of structure. Pages 315, 322, 329, 344

8. Look for and express regularity in repeated reasoning. Page 336