Manual Fit

ID: 12275

Time required
20 minutes

Activity Overview

In this activity, students will utilize the grab and move feature to manipulate parabolas so that the curve matches a set of data points. This activity will serve to reinforce understanding of the vertex form for a parabola.

Topic: Quadratic Functions

- *Students will drag the parabola so that its vertex and shape match a set of plotted points.*
- *Students will assess their understanding of vertex form by answering questions about the value of a and its contribution to shape and direction of opening.*
- *Students will encounter some parabolic shapes that appear in our daily lives, and will be provided with extensions/homework with regard to similar shapes.*

Teacher Preparation and Notes

- *Students will need to be able to manipulate the cursor arrow toward a certain part of the parabola to obtain the two different tools for the grab and move. The cursor arrow will point to the vertex and reveal a symbol for moving the vertex or point to the body of the graph and reveal an oblique (slanted) symbol that indicates moving the width of the opening.*
- *Students will answer questions about the vertex, direction of opening, and the relative width of opening for a particular shape.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "12275" in the quick search box.***

Associated Materials

- *ManualFit_Student.doc*
- *ManualFit.tns*
- *ManualFit_Soln.tns*

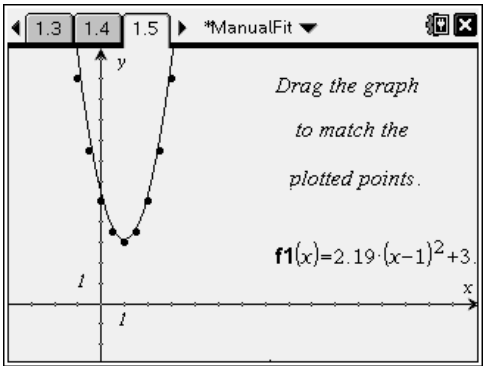
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Exploring Quadratic Functions (TI-Nspire technology) — 9660*
- *Function Junction (TI-Nspire technology) — 9333*
- *Quadratic Connections (TI-Nspire technology) — 9294*
- *Exploring Transformations of the Quadratic Function (TI-Interactive) — 7906*

Problem 1 – Match the graph, Part 1

Vertex form for the equation of a parabola is shown. Students will use this information on the next few pages to help them answer questions.



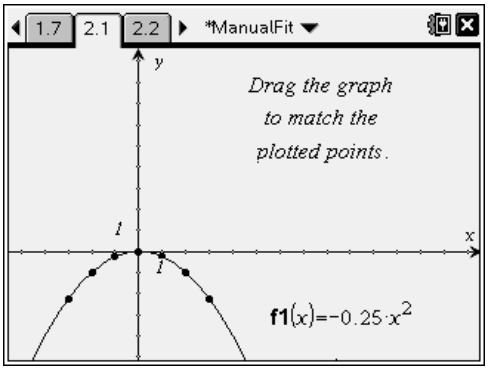
Instruct students that if they grab the vertex of the parabola, they can move the parabola right, left, up, or down and the (*h*, *k*) part of the equation will change. If they grab the "body" of the parabola, they will be able to change the width of the opening of the curve.

Notice that the students may not get the "exact" answer that they wish. In this case, discuss why dragging can help to approximate an equation. Instruct students that they can also double click on the equation on-screen and type in the equation if they want.

Students can self check any answers to assess their understanding by selecting **MENU > Check Answers**.

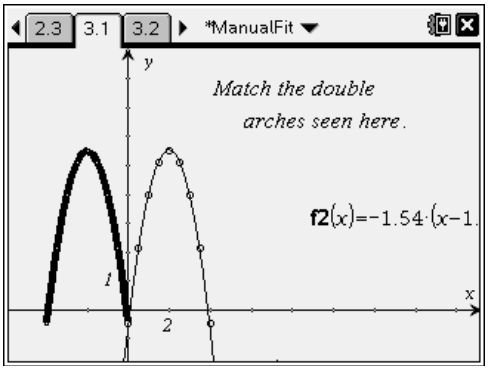
Problem 2 – Match the graph, Part 2

Students are given another set of plotted points and asked to grab and move the parabola to match the graph. Encourage discussion of the placement of the vertex, and the relative width of the curve. This time, a negative value for *a* is required.



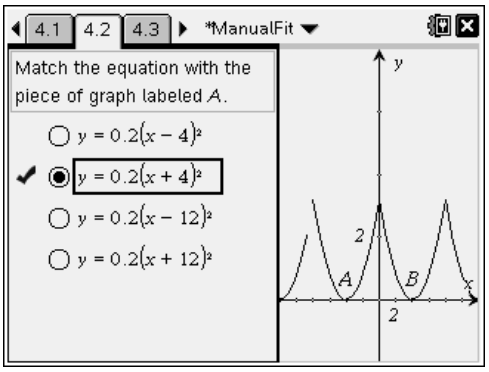
Problem 3 – Match the Double Arches

After matching the data well, the "M" double arches appear quite nicely. Discussion could follow about reflections, symmetry, and the design of company logos using mathematical or geometric figures that are pleasing to the eye.



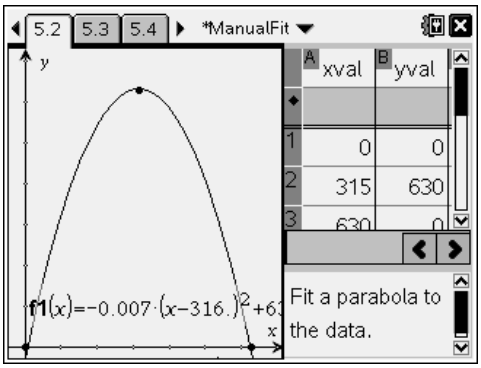
Problem 4 – The Main Cables of a Suspension Bridge

Several loops of cable are represented here. On pages 4.2 and 4.3, students will be matching an equation to a particular piece of the graph. What the students have learned about vertex form should be of help in this problem.



Extensions/Homework – The St. Louis Arch

The St. Louis Arch, the "Gateway" to America, is a shape that looks like a parabola to the casual observer (It is actually called a catenary curve.).



Students will create an equation in vertex form to match the dimensions of the arch given on page 5.2.

Using the same data, students are asked to match the graph in standard form by dragging the parabola. Important things to remember are: what does the value of *a* do to the graph, and what would your *y*-intercept be (*c* in the equation)?

Discussion that follows includes how the equations are the same, and different. Assist the students in expanding the vertex form so that a direct comparison can be made for the two equations.

Extensions/Homework – Other Arches

This section gives students a few real-world situations where they can find parabolas. Students can find the equations that model these situations.