Manual Fit

ID: 12274

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 graph 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 worksheet, go to education.ti.com/exchange and enter "12274" in the quick search box.***

Associated Materials

- *Alg1Week23_ManualFit_Worksheet.doc*

Suggested Related Activities

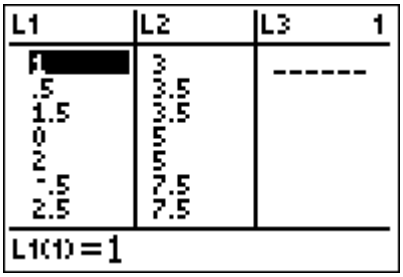
To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Graphing Quadratic Functions (TI-84 Plus family) — 9406*
- *Writing Equations of Parabolas in Vertex Form (TI-Navigator technology) — 7073*
- *The Standard Form of the Quadratic Equations (TI-Interactive) — 4688*

Problem 1 – Match the graph, Part 1

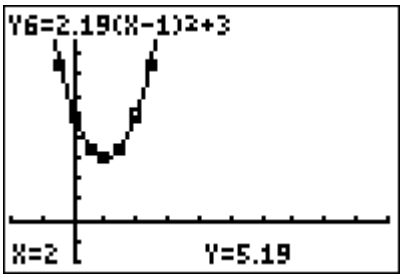
Vertex form for the equation of a parabola is shown. Students will use this information in the next few questions to help them answer questions.

Instruct students that to change the graph, they can substitute different values into the **Y=** equation. Students should enter initial values (non-zero) into the vertex form of the equation to begin their exploration.



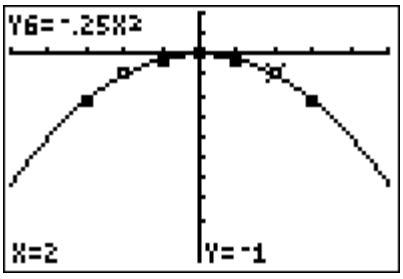
Notice that the students may not get the "exact" answer that they wish. Tell them that they will find more exact methods of finding matching equations for data in later classes.

You may also want to cover the affects of changing the window on the appearance of the graph. Stress the importance of knowing the minimum, maximum, and scale to determine the equation.



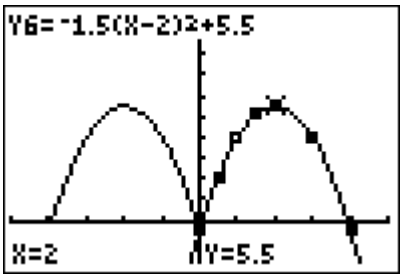
Problem 2 – Match the graph, Part 2

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.

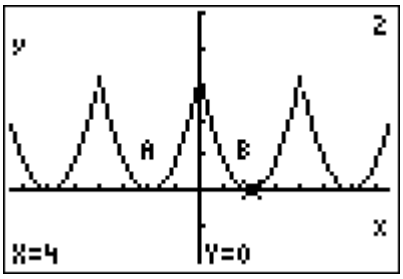


Problem 4 – The Main Cables of a Suspension Bridge

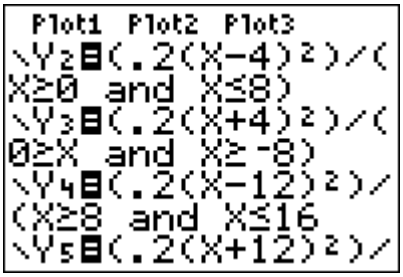
Several loops of cable are represented here. Students will be matching an equation to a particular piece of the graph. What the students have learned about vertex form should be of help in this problem.

Section A: $y = 0.2(x + 4)^2$

Section B: $y = 0.2(x - 4)^2$



To graph the given screen, see the equations to the right. Conditional statements are used to limit the domain of the function.

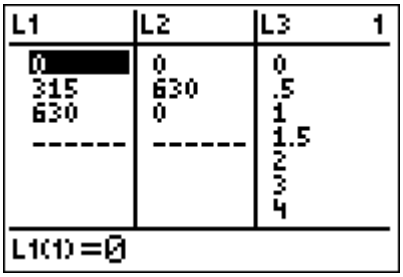


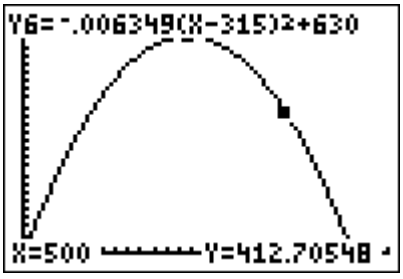
Extensions/Homework – The St. Louis Arch

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 data given in $\mathbf{L_1}$ and $\mathbf{L_2}$.

Using the same data, students are asked to match the graph in *standard form*. 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.