

Parabolas in Factored Form

Description: Students plot a quadratic function in factored form, investigate the relationship between the equation and its graph, and use their observations to create functions from various descriptions of their graphs.

Technology Strength: By adjusting sliders that control three parameters and then using these parameters as a quadratic function's roots and leading coefficient, students can quickly graph a quadratic in factored form. By changing these parameters one at a time, students can easily explore the relationship between the parameters and the function's graph.

Objectives: Plot a quadratic function using its roots and leading coefficient; investigate the relationships between the roots and leading coefficient of a quadratic function in factored form and its graph

Prerequisites: Some experience graphing quadratic equations

Suggested Grade Level: 8 to 11

Sketchpad Level: Intermediate

Suggested Duration: 45 minutes. To shorten this activity, students can use page 2 of the sketch document and start with the Exploring Families of Parabolas section of the worksheet.

Suggested Classroom Setting: Whole Class, Student Pairs

Preparation: Review the Activity Notes. For a student-pairs activity, preview the student sketch, work through the steps on the worksheet, and make a copy of the worksheet for each student. For a whole-class presentation, use the presentation sketch.

Materials: None

Student Worksheet(s): Parabolas in Factored Form

Student Sketch: Factored Form.gsp

Presentation Sketch: Factored Form Present.gsp

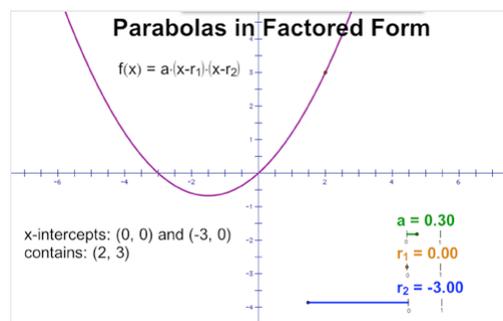
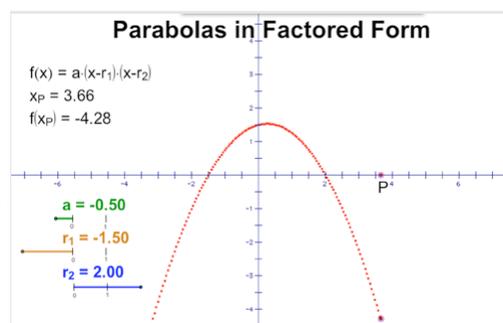
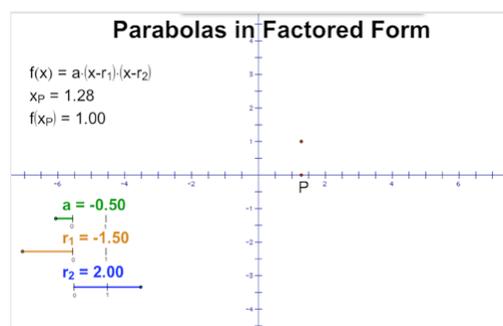
Vocabulary: Root, factored form

Sketchpad Version: GSP5

Using the Sketch:

Students are given a coordinate system and three sliders that control the parameters a , r_1 , and r_2 . Students use the sliders to define the function $f(x) = a(x - r_1)(x - r_2)$. They then construct a point on the x -axis to represent the independent variable, calculate the value of the dependent variable, and plot the resulting ordered pair. Next, students drag the independent variable, trace the position of the plotted point, and discuss the behavior of the plotted point and the shape of the trace. Students plot the function and explore the roles of each of the three parameters by changing them slowly one at a time and observing the changes in the graph. They describe in their own words what features of the graph change and what features stay the same as a particular parameter is changed. Finally, students are given descriptions of particular parabolas and they adjust the parameters to create the described graph.

In the Explore More section, students investigate the relationship between the roots and the vertex. They write an expression for each coordinate of the vertex and then use these expressions to plot the vertex. They test their construction by changing the values of the parameters and checking that the point stays at the vertex.



Sketch Tips:

Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	Tip Sheet or Tip Video
Step 4: Measure the coordinates of a point using Measure Abscissa , Measure Ordinate , or Measure Coordinates	Measuring Coordinates
Step 5: Click a value in the sketch to enter it into the Calculator	Using the Calculator
Step 6: Plot a point by selecting two values and using Graph Plot as (x,y)	Plotting Points
Question 1: Trace an object using Display Trace	Tracing
Step 7: Erase traces using Display Erase Traces	Tracing