

Conic Section Project

Objective—Students will be able to...

- use conic section equations to create a piece of “art work” on the TI-83 or TI-84
- create a table in Word
- use the program, Math Type (an equation editor) or equation editor found on your computer, to input equations into documents
- set a schedule

Materials: Graph paper
Colored Pencils
Graphing Calculator

Project: Draw a picture on the coordinate plane using mathematical equations.

Requirements:

1. Sketch the drawing of what you wish to create through equations on a half sheet of plain white paper.
2. A drawing on graph paper to scale with the scale marked on the graph paper
3. A colored drawing on graph paper to scale but without the scale
4. A drawing on the graphing calculator of the conic “art work”
5. A print-out of the calculator drawing—colored.
6. Copy of the drawing that can be used to grade accuracy of the work (not colored). This copy should include the number (refer to the table) of each corresponding equation pointing to the specific part it is representing. It also should have the axes, origin and units marked. Remember the units should match those of your calculator window.
7. Print out of the calculator screen each time equations are inputted into the y= window. You will have several of these by the time you are completed.
8. Project must contain a minimum of 15 equations made up of at least 2 circles, 2 parabolas, 2 hyperbolas, 2 lines and 2 ellipses (a circle will not count as an ellipse). Vertical and Horizontal lines will not count towards the 15 minimum equations or towards the 2 linear equations needed.
9. Window on the calculator for the picture must be x-axis [0, 20] and the y-axis [0, 15]. Units must be either whole or half units. You may NOT have any other partial units.
10. A table with required information concerning the equations. Have all types of graphs grouped together in the table in the order listed under essential information, ie. All circles together, all ellipses together, etc. Have your name typed on the sheet.

a. Model of the table

Type	Number	What part of the picture the equation represents	Spencer's Standard Form	Calculator Form	Essential information	Restrictions, if necessary
Circle	1	Right eye	$(x - 3)^2 + (y + 2)^2 = 25$	$y = -2 + \sqrt{25 - (x - 3)^2}$ $y = -2 - \sqrt{25 - (x - 3)^2}$	C(3, -2) r = 5	NA

- b. Essential information
 - i. Circles center, radius
 - ii. Ellipses center, value of a and b
 - iii. Hyperbolas center, value of a and b
 - iv. Parabolas vertex, value of p
 - v. Lines slope, y-intercept
- c. Equations
 - i. Equations must be in required forms found below.
 - ii. List the equation only once. If the equation must be manipulated to put into the calculator list both equations under one number. If there are several restrictions, list all restrictions one below the other in the table.
 - iii. Must use Math Type or another equation editor to import equations into your document. (This is available through the terminal server.)
- d. Spencer's Standard Form for Equation
 - i. Circles

$$(x - h)^2 + (y - k)^2 = r^2$$
 - ii. Ellipses

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1 \text{ or } \frac{(y - k)^2}{a^2} + \frac{(x - h)^2}{b^2} = 1$$
 - iii. Hyperbolas

$$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1 \text{ or } \frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$$
 - iv. Parabolas

$$(x - h)^2 = 4p(y - k) \text{ or } (y - k)^2 = 4p(x - h)$$
 - v. Lines

$$y = mx + b$$
- e. Calculator Forms for equations
 - i. Each must have the equations solved for y in order to place it into the calculator. You may have to have two equations in some cases in order to graph the equation. (Hint: Those equations which are not functions will have two equations that need to be placed into the calculator.)
- f. Restrictions
 - i. Must be given for all parabolas, hyperbolas, and lines.
 - ii. May be used for circles and ellipses if necessary.
 - iii. You cannot restrict a hyperbola so that it looks like parabola.

11. Grading

- a. 5 points—creativity of picture

1 pts simple	\longleftrightarrow	5 pts very creative
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- b. 25 points—meeting of the minimum requirements
- c. 42 points—meeting requirements and verification of equations
- d. 3 points—Bonus for going the extra mile
- e. Being late will result in a 10-point deduction each day. The definition of the next day is any time within a 24-hour period after I requested the project. Examples of being late:
 1. Joe forgot his project in his locker. It is late, -10 points.

2. I asked for the project. Joe left his project at home. Mom brings it to school. It is late, -10 points.
3. Joe doesn't have the project when requested. He hands it in the next day at the beginning of class, -10 points.
4. Joe doesn't have the project done when it was due. He hands it in two days later. -20 points.

The drawing can be an original design or based upon another picture—check out coloring books! I do not want to see the same picture done by two or more people. If you do use a picture please include a copy with the project. The work will mainly be on your own time. Occasionally, I will give you time in class, but you cannot count on it.

Enjoy being a “mathematical artist”!!

Schedule of project—

1. Due Date for sketched drawing....._____
2. Due Date for your picture on graph paper to scale....._____
3. Due Date for your picture on graph paper to scale that is colored....._____
4. Due Date to have the picture printed from your calculator....._____
5. Due Date to have the coloring done....._____
6. Due Date for working copy of drawing on graph paper....._____
7. Due Date of Print outs of equations in $y=$ window....._____
8. Due Date for the blank table (headings only)(see #10 in requirements)....._____
9. Due Date to have information typed into the table(see #10 in requirements)..._____