

The Art of Graphing

This activity is designed to enhance students' understanding of equations of linear functions. Although it is designed for use in the Algebra I classroom, the value of the lesson lies in all of the possible mathematical extensions. This activity can be modified to introduce topics in a Pre-Algebra class all the way through an advanced Calculus class.

Objectives:

- ✓ The students will be able to construct lines on the coordinate plane and determine the equation of each.
- ✓ The students will be able to represent each line in various forms. (Slope-Intercept, Standard, Point-Slope).
- ✓ The students will be able to distinguish between parallel and perpendicular lines visually and verify them algebraically.

Part I: (Mathematical Content)

Given the picture of the star, for each line identify:

The slope of the line.

The y-intercept of the line.

A point on the line that is not the y-intercept.

The equation of the line.

Your final answers will be submitted on the given table, but your work must also be submitted. This work must be neat and labeled.

Class Model Answer Sheet (Star) (Visual on Graph)

Line	Slope	Y-intercept	Point on line	Equation
A				
B				
C				
D				
E				
F				
G				
H				
I				
J				
K				
L				
M				
N				
P				

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Part II:

Create your own drawing containing **at least 15** straight lines on graph paper. Be as neat as possible (several drafts may be necessary, submit only the final draft). Your drawing may contain more lines than the ones you actually use to write the equations. Submit all work done neatly.

Create your picture following these guidelines for your written equations:

- ✓ At least one but no more than two horizontal and two vertical lines.
- ✓ At least one set of parallel lines
- ✓ At least one set of perpendicular lines (they do not necessarily have to intersect)
- ✓ Five equations written in point-slope form.
- ✓ Five equations written in slope-intercept form.
- ✓ Five equations written in standard form.

Fill in the provided table with the following information for each line:

- ✓ The slope of the line.
- ✓ The y-intercept of the line.
- ✓ A point on the line that is not the y-intercept.
- ✓ The equation of the line. (5 of each form)

Answer the following questions by showing your work or by writing well thought out responses.

- ✓ Which lines are parallel? What do you notice about the equations of these lines? Explain.
- ✓ Which lines are perpendicular? What do you notice about the equations of these lines? Explain.
- ✓ What is different in the equations of vertical and horizontal lines, compared to the rest of your lines? Explain.
- ✓ Identify any lines of symmetry in your drawing.
- ✓ Explain how your picture would change if you doubled the value of each x coordinate and y coordinate in your drawing.
- ✓ Explain how your picture would change if you doubled the value of each x coordinate value in your drawing. (Keeping each y-coordinate the same)
- ✓ How are you able to verify that a third point is on the same line as other points?

Extensions (Mathematical features that lead to further mathematical development):

- ✓ Students could specify a domain for the functions
- ✓ Students could find the equations of non-linear functions in the drawing (Polynomials, Rational, Radical, Conic, Logarithmic, Trigonometric, Exponential, Polar Curves, etc.)
- ✓ Students could find the area and perimeter of various regions in the picture
- ✓ Students could solve for the points of intersection using systems of equations (Substitution, Cramer's Rule, Matrices, etc.)
- ✓ Students could generate the picture using technology
- ✓ Students could exchange data with domains and recreate another student's sketch.

Anticipated Student Misconceptions/Errors:

- Confusing the axes.
- Confusing and mislabeling the coordinates.
- Confusing parallel and perpendicular lines.
- Confuse the equations of vertical and horizontal lines.
- Confusing the equation for slope of a line.
- Confusing positive and negative slope.
- Mislabeling points.