Project Title: **Designing a Roller Coaster**

Introduction: This graph represents a roller coaster:

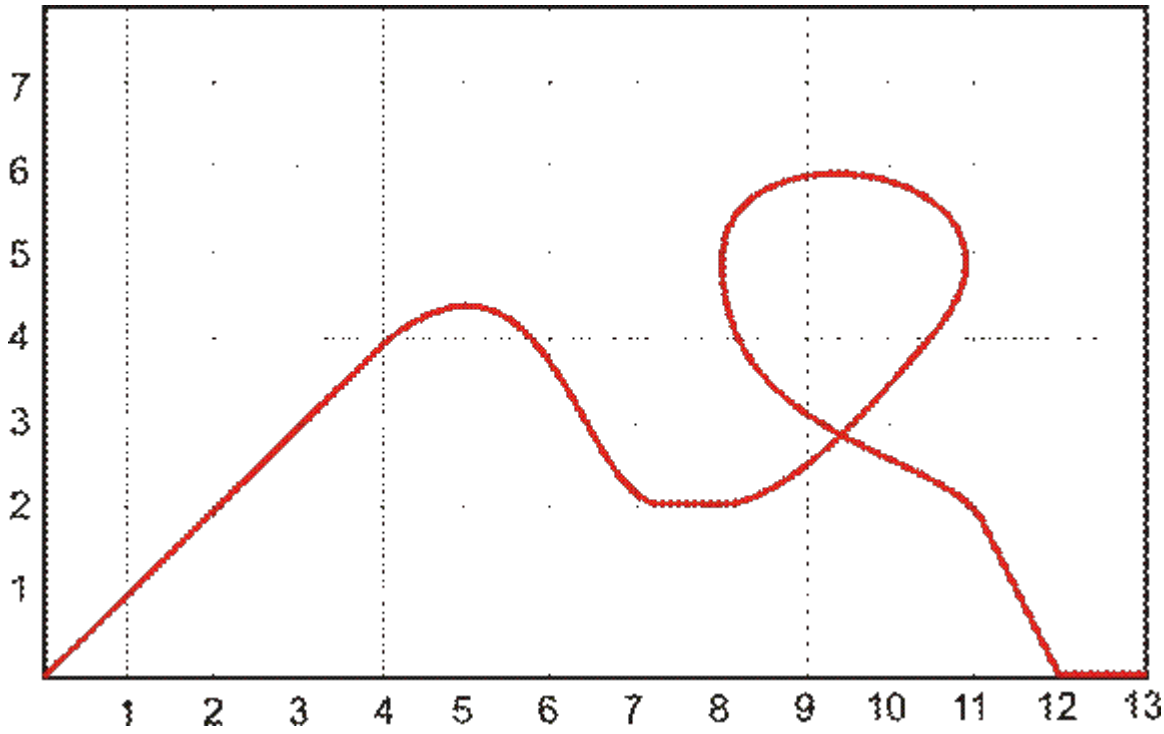

Figure1: Sample Roller Coaster Sketch

Problem 1:

Examine the graph of the side view of a roller coaster (Figure 1 above). What can you say about the graph between $x = 0$ and $x = 4$? What is special about the curve between $x = 8$ and $x = 11$? Use your knowledge of proportional, linear, and non-linear functions to describe the roller coaster's curve on each different section of the track.

Problem 2:

If roller coasters run on gravity, do you see any problems that this roller coaster will run into when it tries to do the loop if it's speed is all from the hill shown at X=5?

Problem 3:

Go to the internet: Can you discover the relation between a roller coaster's speed and how far it has fallen? Is this relation a function?

Design and Model Your Own Roller Coaster

Now it's your turn. You will design a roller coaster. Use these websites to get ideas for your roller coaster, or search the Internet for roller coaster *designs*:

http://www.coastergallery.com/2000T/hp.html

http://www.coastergallery.com/1999T/SFGA.html

Pay special attention to how tall most coasters are. You need to design your own roller coaster and graph the whole thing or just a portion of it. The portion you choose should have at least two hills with straight edges and one loop. Decide about how tall and how wide your coaster would be in real life and where your hills and loop will be.

Layout both the "X" and "Y" axes, labeling each axis with appropriate intervals of distance and height. Title your graph paper with the name of your roller coaster. Using a ruler, draw a side view of it on a piece of graph paper leaving at least 15 lines below the graph as room for description and labeling. Neatness counts, so use a ruler and use a pencil. Accuracy counts. If your second hill is half the height of your first, it should be drawn that way.

Once you've drawn your graph and had it approved by your teacher, color code it with highlighters, markers or colored pencils. Show in Green any linear functions. Show in Yellow any non-linear functions. Show in red any non-functional relations.

Create three (x,y) tables beneath your graph. Fill these with at least four points from each of the color coded sections and label them according to the section they represent (linear function, non-linear function and so on). Remember, the line of the graph is made up of (x,y) points. To get (x,y) point coordinates for your table from your graph, go out along the X axis a small distance of your choice, record that amount as your X coordinate. Then, go straight up until (parallel with the y-axis) until you hit the graph. However high this is will be your Y coordinate. If you would hit your graph at two separate points as you continued up from the X-axis, record both these points in your table.

WRITING TASK

Write a one to two-paragraph explanation that compares and contrasts how different sections of your roller coaster relate to functions. Referring to your graph, describe the domain and range of any proportional, linear, or non-linear functions. Refer to the tables of points from each portion of the domain of your graph and explain how the (x,y) points from each section show that section is a linear function, a non linear function, or a relation (but not a function).

Grading:

This project is due at the end of class on November 26th, 2014. This project will not be accepted late.

Your project will be given a score of 1 to 4, with 4 being the highest score possible. You will be evaluated based on the following criteria:

Score	Content
4	Your project includes a complete understanding of the algebra functions required to solve the problems. Your written reports use appropriate algebra functions to answer problems. Your project uses appropriate graphs and tables to support written reports.
3	Your project includes a good understanding of the algebra functions required to solve the problems. Your written reports use appropriate algebra functions to answer problems. Your project uses appropriate graphs and tables to support written reports.
2	Your project includes a good understanding of the algebra functions required to solve the problems. Your written reports do not include all the appropriate algebra functions to answer problems. Your project's graphs and tables do not support written reports.
1	Your project does not show you understand the algebra functions required to solve the problems. Your written reports do not indicate you understand all the appropriate algebra functions to answer problems. Your project's written reports do not include graphs and tables.