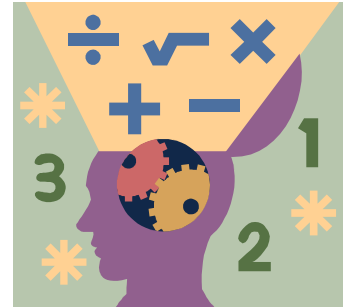


# Algebra/Geometry Institute Summer 2010

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School: Summer Institute 2010

Grade Level: 10<sup>th</sup> – 12<sup>th</sup>

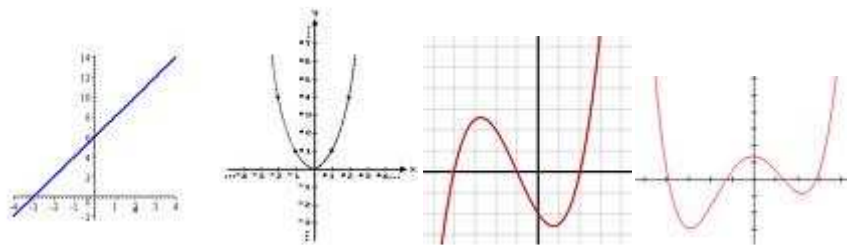


## 1 Teaching objective(s)

- AA.4a. Use technology and regression analysis to determine appropriate quadratic and cubic functions modeling real-life data (DOK 3)  
(MS Revised Framework p.61, Data Analysis and Probability Obj. 4a.  
[http://www.mde.k12.ms.us/acad/id/curriculum/math/2007\\_framework/2007%20MS%20Math%20Framework%20Competencies%20and%20Objectives%209-18-07.pdf](http://www.mde.k12.ms.us/acad/id/curriculum/math/2007_framework/2007%20MS%20Math%20Framework%20Competencies%20and%20Objectives%209-18-07.pdf))  
“Institute Content Based on the Mississippi Mathematics Framework” II.  
Understand, representing, and analyze patterns, relations, and functions. E. Given a real life situation, sketch a graph.

## 2 Instructional Activities

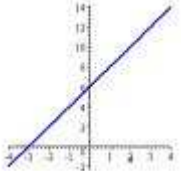
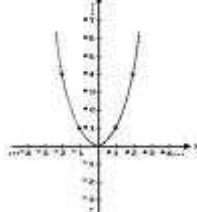
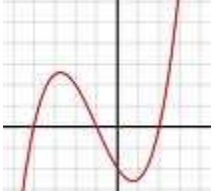
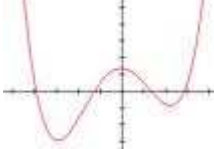
- Introduction
  - Do Now ( review of polynomial functions)  
Classify the each function as being linear, quadratic, cubic, and quartic.
    - Students will be given graphs of different functions



(These graphs were inserted from Google images <http://www.google.com/images?um=1&hl=en&tbs=isch:1&ei=zAMpTNP1D4H6lwfFg6GACA&q=graph+of+a+function&sa=N&start=20&ndsp=20>)

- After students attempt to classify they will be asked questions about how and why they decided to put which functions into what category.
  - What patterns or changes do you see from one graph to another?
    - The number of directional changes of each function increases as the power of the functions increases

- I will show the students a chart which contains each function’s name, an example of the function graph, and the number of changes for each function.

Name and Equation of Polynomial Function where a, b, c, d, and e are real numbers	Number of Changes in Direction	Example of Graph
Linear Function $ax + b = 0$	0	
Quadratic Function $ax^2 + bx + c = 0$	1	
Cubic Function $ax^3 + bx^2 + cx + d = 0$	2	
Quartic Function $ax^4 + bx^3 + cx^2 + dx + e = 0$	3	

(This table was modified from “Graph Pad Software”  
[http://www.graphpad.com/curvefit/other\\_regressions.htm](http://www.graphpad.com/curvefit/other_regressions.htm))

- Note: If you are unsure of the number of changes of the data then another way to classify the function is to look at the behavior of the function.
  - The function may be a straight line, U-Shaped with both ends of the function going in the same direction, N-shaped with ends going in opposite directions, or W or M- shaped also with both ends going in the same direction.
- Lesson
  - After we have learned how to classify functions from their graphs we will learn how to use this information to use technology and regression

analysis to determine appropriate quadratic and cubic functions modeling real-life data.

- We will take data and insert that data into lists in the Stats Menu of the calculators by going to Stats: Edit. The data will be inserted into  $L_1$  and  $L_2$ .
- After putting the data into these lists students will graph the data by going to the Stat Plot Menu by pressing  $2^{nd}$  Y=.
- From there students will press enter, turn the plot on by moving the blinking cursor over on and pressing enter. To make sure the calculator graphs the correct information look at the Stat Plot Menu and make sure that X list:  $L_1$  and Y list:  $L_2$ .
- Then to tell the calculator to graph the data students will go to Y=, move the cursor over Plot1 and press enter.
- Lastly graph the data by going to Zoom 9:ZoomStat.
- Once the data is graphed students will use the information that they learned early about the different types of functions to classify the function and find the regression line (best fit line) of the data that will best represent the data and allow you to make future predictions about the behavior the data.
  - Once students have classified the functions they will find the regression line by going to Stat: Calc, and depending the classification of the function, press either: 4:LinReg, 5:QuadReg, 6:CubicReg, or 7:QuartReg, and then press enter twice get the information given and write your equation form that information by plugging in the values for the coefficients of x.

➤ Activity

- Students will each bring in a list of data that will be used in the lesson
  - Each set of data must be from real-life information and the two lists must be related.
    - Ex)

Purse size (volume)	Number of Items that fit inside the purse
12 in <sup>3</sup>	3
24 in <sup>3</sup>	5
36 in <sup>3</sup>	8
48 in <sup>3</sup>	12

- Classify and write an equation/ regression rule that best represents your data.

3 Materials and Resources

- Calculators
- Overhead calculator
- Paper
- Pencils
- Google images
- “Institute Content Based on the Mississippi Mathematics Framework” II. Understand, representing, and analyze patterns, relations, and functions. E. Given a real life situation, sketch a graph.
- [imageshttp://www.google.com/images?um=1&hl=en&tbs=isch:1&ei=zAMpTNP1D4H6lwfFg6GACA&q=graph+of+a+function&sa=N&start=20&ndsp=20](http://www.google.com/images?um=1&hl=en&tbs=isch:1&ei=zAMpTNP1D4H6lwfFg6GACA&q=graph+of+a+function&sa=N&start=20&ndsp=20)
- (This table was modified from “Graph Pad Software” [http://www.graphpad.com/curvefit/other\\_regressions.htm](http://www.graphpad.com/curvefit/other_regressions.htm))

#### 4 Assessment

- Students will be questioned during the lesson
  - Do you understand what I’ve just explained to you?
  - Do you have any questions about what we’ve done or I’ve done so far?
  - Is anyone having trouble with their calculators?
- Students will be asked to bring in a list of data that has two sets of information that are related.
  - Ex) This information is not correct

Type of Candy Bar	Calories in Candy Bars	Fat Grams in Candy Bars
Snickers	125	70
Twix	112	90
Kit Kat	104	66
Baby Ruth	150	100

- Students will use this information to find a regression rule for the data.
  - N-Shaped, so it is a cubic function, which means you will press Stat: Calc: 6:CubicReg: enter: enter. This will give you the information you need to write the regression line.
  - Randomly chosen students will present their information to the rest of the class.
  - Students will be given a participation grade for this assignment.