**Lesson Title: Identifying features of graphs using technology**

**Unit Title: Graphing Functions**

**Teacher Candidate: Bertha Valencia**

**Subject, Grade Level, and Date: Algebra I class 9th grade**

**Placement of Lesson in Sequence**

This lesson would be the first lesson when beginning the unit of graphing functions.

**Central Focus and Essential Questions**

The central focus of this lesson is for students to understand key components when graphing lines by hand or when using technology software to graph functions. Some essential questions students will be able to answer after this lesson are, “What does the x and y intercept mean on a graph?” and “How do the x and y intercepts relate to the function written symbolically?”

**Content Standards**

[CCSS.Math.Content.HSF.IF.C.7](http://www.corestandards.org/Math/Content/HSF/IF/C/7/)
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*

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| **Learning Outcomes** | **Assessment** |
| Students will be able to use technology to verify and conjecture about key features of a graph. | Student will be informally assessed when working with partners and discussing and verifying their graphs. A formal assessment will be made when students are asked to graph functions on grid paper and turn it in at the end of class.  |

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| **Learning Targets** | **Student Voice** |
| I will be able to graph a function by hand and also graph a function using an app to verify components of the graph. | Students will be able to ask clarifying questions when explained how to use the graphing app to verify graphs. Students will also be able to ask questions when working in pairs if partners are having a difficult time deciding who is correct when graphs do not match.  |

**Prior Content Knowledge and Pre-Assessment**

Students have prior knowledge when working on a two coordinate plane and graphing points. Students have also seen functions expressed symbolically and know what the coefficient means and what the constant means when a function is in the form y=mx+b. A pre-assessment was performed by simple activity in the previous class to have an idea where student’s comfort level was when working with a two-coordinate plane and plotting points. The pre-assessment is very important because getting an idea of how sharp those skills are will play a big role in this lesson. Deciding how much help students need in simply plotting points could affect instruction before the activity if review is necessary for most students.

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| **Academic Language Demands** |
| **Vocabulary & Symbols** | **Language Functions** | **Precision, Syntax & Discourse** |
| * Slope
* x-intercept
* y-intercept
 | Students will need to communicate effectively by using the correct vocabulary terms when discussing key features of the graphs the students will be working with. | **Mathematical Precision:** When graphing functions by hand or using the graphing calculator app, students will need to be precise or discrepancies will occur amongst partners. **Syntax:** Students will be given several equations they might have to manipulate in order to graph on the graphing calculator app. When graphing by hand, manipulating the equation to find the slope and y-intercept will have to be done. **Discourse:** Students will be in pairs and alternating between graphing by hand and on the graphing calculator app. Students will be checking their own work by comparing their answers and deciding who is correct when the graphs do not match.  |

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| **Language Target** | **Language Support**  | **Assessment of Language Target** |
| Students will be able to use correct vocabulary when referring to key features of the graphs and comparing graphs with partner. | The biggest language support students have is the classmate they will be working with. If students are having trouble using the vocabulary words correctly, the student’s partner can be the first to correct and help the student use the vocabulary words correctly. The teacher will also be available to help students who need language support. | Students will be informally assessed on the language target by the teacher listening to conversation among students when speaking about the graphs they came up with. A formal assessment would be taken when students have to write down the key features of the graphs on the grid paper where the functions were drawn by hand.  |

**Lesson Rationale (Connection to previous instruction and Objective Standards)**

 This lesson connect to previous instruction because it is the next step when exploring functions. After learning how to manipulate and know what features a function has, the next step is to be able to represent it in a different form. Given a function expressed symbolically, it is very important for students to learn how to express it as a graph so the relationship between variables is seen visually. This lesson expands on what students know and makes them use their knowledge about functions and apply it when learning a new skill.

**Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences**

In this lesson, students will be in pairs for the majority of the class time. This gives students who need a little more help a classmate that is there that can help them understand some of the misconceptions they might be having. Being able to work with others is a very important life skill. Students working and communicating with assigned partners can help students be culturally responsive because of the diversity of the classroom.

**Materials – Instructional and Technological Needs (attach worksheets used)**

Grid paper for each student

Worksheet for each student with eight different functions for students to create graphs with

Students with a smart phone, iPod, or tablet can download the free graphing calculator app

For students who do not have a smart phone, iPod, or tablet a tablet with the free graphing calculator app would need to be provided for each pair of students

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| **Teaching & Instructional Activities** |
| **Time** | **Teacher Activity** | **Student Activity** | **Purpose** |
| 5 min | Review plotting points on a two-coordinate plane | Ask questions about plotting points if there are any. | In order for students to be successful in this lesson’s activity it is important for students to  |
| 10 min | Introduce the free graphing calculator app and show students useful features. Go through a couple of examples of graphing a function so students know how to input and view the graph on the app.  | Students will learn about the free graphing calculator app and how to use. Ask clarifying questions if an aspect of the app seems confusing and unclear.  | While in pairs, one student will graph by hand and the other will use the app to graph the same function. Knowing how to use the app is necessary so that students can compare their graphs.  |
| 25 min | Teacher will be actively observing students, while they work in groups. While listening to students conversations, the teacher can informally assess how well students are showing key features of the graphs and using correct vocabulary when describing their thoughts.  | Students will be in pairs and alternating between graphing the functions by hand and on the free graphing calculator app. Students would compare their graphs and point out the key features of the graph. If the graphs do not match, students would discuss and decide which graph is correct. Students who cannot agree when graphs do not match can ask the teacher or other groups for help.  | The purpose of the activity is for students to be able to graph functions expressed symbolically by hand and by using technology. Students being in pairs and working on the same problems but doing it in a different form is a great way for students to get immediate feedback on how well they are doing.  |
| 10 min | After the activity, teacher will lead a class discussion about the functions and their graphs. Students will be chosen to share how they modified the equations to be able to graph them by hand and on the app. Answering general questions students may have can also be done at this time. | Students will share their graphs and methods to the class. Questions regarding certain graphs or functions can be asked at this time. Students can ask clarifying questions to their peers if their methods are unclear when explaining their answers. | This last group discussion is a good way for the teacher to evaluate how well students did when graphing the functions. It can also be a time when students can evaluate themselves by comparing their graphs to the rest of the class.  |