Lesson Title: Inverses of Functions **Date:_____**

Subject: Algebra I or Algebra II	T**opic:** Inverses of Functions
Grade: 8 - 11	**Designer:** Jessica Ulcickas

Stage 1 – Desired Results

Lesson Overview: This activity teaches students how to graph a function's inverse when given the original function. The activity walks students through a series of discrete and continuous functions for which students will have to identify the domain and range, as well as the domain and range of the inverse, and graph the inverse. By the end of the activity, students will be able to find the inverse relation of a discrete function, graph the inverse relation of a discrete function, graph the inverse relation of a continuous function, and identify domain and range for functions and their inverses. This activity can be used at the end of a chapter on functions.

Standards Addressed:

CCSS.MATH.CONTENT.HSF.BF.B.4
Find inverse functions.

CCSS.MATH.CONTENT.HSF.BF.B.4.C
(+) Read values of an inverse function from a graph or a table, given that the function has an inverse.

Enduring Understanding:	**Essential Questions**:
Every function has an inverse. The inverse of a function is a new relationship where the output and input are switched. There are two methods to graph the inverse of a function. The first way is by switching the x and y values of the original function. The second method is to reflect the graph of the original function over the line $y = x$. The inverse of a function isn't always a function. One is able to tell whether or not a function's inverse is also a function by using the horizontal line test.	How can you graph the inverse of a function without knowing what the equation for the inverse is? How can you tell if the inverse of a function is also a function? What is an inverse of a function?
Students will need to know:	**Students will be able to**:
Students will need to have basic knowledge of functions and their graphical representations. Students should know domain, range, and the vertical line test. Students should also be familiar with the difference between a discrete function and a continuous function.	• Identify the inverse relation of a discrete function. • Decide whether the inverse of a given function is also a function using the horizontal line test. • Graph the inverse of a function by switching the ordered pairs of that function. • Graph the inverse of a function by reflecting the function over the line $y = x$.

Stage 2 – Assessment Evidence

Performance Tasks:
In this activity:

- Asking students to identify the inverse relation of a discrete function.
- Asking students to decide whether the inverse of a given function is also a function using the horizontal line test.
- Asking students to graph the inverse of a function by switching the ordered pairs of that function.
- Asking students to graph the inverse of a function by reflecting the function over the line $y = x$.

Other Evidence:

- To be decided by the teacher.

Stage 3 – Learning Plan

Lesson Procedure:

Many Days Before:

Students will be introduced to the topic of functions. Students will learn what a function is, what domain and range are, and all about the vertical line test. Students also often learn function composition prior to learning inverses.

Day Of:
Students will go to the computer lab in order to complete this activity. For the duration of the activity, the teacher will monitor student progress to ensure that students complete the activity properly and do not simply click to complete. It is recommended that students take notes during the activity. The activity will not take all class period, so the remainder of the class period will be at the discretion of the classroom teacher.

Required Materials:

- Computers for each student.

Possible Discussion Questions for Students:	**Sample Answers to Discussion Questions**:
• In the beginning of the activity, the relationship between Celsius and Fahrenheit was cited as a relationship where you can create two inverse functions. Think of another function that is commonly used. What would the inverse relationship express?	• Sample Answer: $A = \pi r^2$ is commonly used to find area based on radius for a circle. The inverse relationship would have area as the input and radius as the output.
• Do you think it is possible for something that isn't a function to have an inverse that is a function? Give an example.	• Yes. Example: $\{(2,3), (2,4), (2,5)\}$ is not a function, but its inverse $\{(3,2), (4,2), (5,2)\}$ is a function.
• You've learned that inverses are reflections over the line $y = x$. Why?	• The definition of an inverse says that the input and the output are switched. This means that the x and y variables are switched. The line $y = x$ is where x and y variables are equal which becomes the line of symmetry when you switch your x and y variables. Any ordered pair on this line would stay the same since the x and y values are the same.