Lesson Title: Translations of Functions! **Date:_____**

Subject: Algebra II	**Topic:** Vertical Translations of Functions
Grade: 9 or 10	**Designer:** Jessica Ulcickas

Stage 1 – Desired Results

Lesson Overview: In this lesson, students will observe what happens when a constant is added to the equation . They will use this to discuss how adding or subtracting a constant from a function will affect its graphical representation.

Standards Addressed:
CCSS.Math.Content.HSF-BF.B.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Enduring Understanding:	**Essential Questions**:
The equation of a function has a direct effect on its graphical representation. In particular, adding a constant to a function will make it move either up or down depending upon the sign of the constant.	How does the equation of a given function affect the graph of that function? Do all functions behave in the same way?
Students will need to know: Students must have a basic knowledge of what a function is. They must have graphed basic functions by finding matching x and y values. Students should also have a basic knowledge of exponents and the shape of a parabola when graphed.	**Students will be able to**: Graph vertical translations of functions given a benchmark function to work from.

Stage 2 – Assessment Evidence

Performance Tasks:	**Other Evidence**:
In this activity: • Asking students to predict what will happen to a new graph based on prior evidence. • Others to be decided by the teacher.	• To be decided by the teacher.

Stage 3 – Learning Plan

Lesson Procedure:	Required Materials:
Many Days Before: Students will learn about functions leading up to this. The chapter will consist of basic graphing of functions, function notation, composition of functions, and function inverses. Day Of: Students will go to the computer lab in order to complete this 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.	• Computers for each student.
Possible Discussion Questions for Students:	**Sample Answers to Discussion Questions**:
• In this activity we only looked at parabolas. Do you think any of what we explored will hold true for all functions? Why or why not?	• Yes because the function represents y and you are adding to the function. Since the y axis goes up and down, it makes sense that adding to the function would make the graph move up or down.
• Do you think there are other ways to transform a function? What makes you think this?	• Yes, up and down aren't the only possible directions to move on a graph: Students make suggest graphs moving left and right, flipping over, or becoming skinnier or wider.
• How can we relate this to lines? What does the vertical translation mean on an equation of a line in slope-intercept form?	• The vertical translation of a line is the y-intercept. The form clearly shows that the b is the vertical translation but the b also represents the y-intercept.