Amira Aquarian
Math 3

Unit 1: It's A Small World Isn't It Portfolio

Cover Letter:

The central question for unit 1, *It's A Small World Isn't It* is, if the population grows at a constant rate, how long will it be until the people are pressed up together, or how long until each square foot of land is covered by people. To solve this problem, we learned and mastered the skills of using the linear equation y = mx+b, reading and understanding graphs, knowing the difference between linear equations and exponential functions, writing exponential functions, and curve-fitting on a graph.

At the beginning of this unit, we focused on linear functions. Using the formula y = mx+b was review for me but within the concept of it, I learned how it was derived as well as what was being represented within itself. The 'x' and 'y' is a coordinate point that makes the equation true, 'm' stands for slope, and 'b' is the y-intercept. The assignment named *More About Tyler's Friends* allowed me to practice and become comfortable with the idea of finding the slope of a linear line. This is one of the most important stepping stones to know before mastering the use of y = x+b. Using the skills I learned from that worksheet, I was able to complete *Wake Up!*. This assignment helped me practice taking the skill of finding the slope, and plugging it into the rest of the formula y = mx+b to solve for other components and/or write a linear function for a given line.

Once we practiced using this equation, we were able to recognize that linear equations weren't a good representation of growth. This is because when looking at growth with this equation, it assumes that each variable stays the same throughout long periods of time when in reality, they don't. The ideal function to represent the rate of change and continuous growth is exponential functions. After studying different scenarios of population growth and compound interest, we finalized the topic of an exponential function which can be simplified into the equation $y = ke^{cx}$. The linear equation represents rates of growth/change in situations where the rate of growth is never changing. For example, a problem like: you and your friend group start with 44 burritos and after a 202 days trip returning with 2 burritos, what is the average number of burrito's consumers per day. Another example would be if you were given $423 each month and you were asked to find the total at the end of the year, that would be a linear equation. On the contrary, an exponential function is appropriately used in a problem where the rate of money being earned is not the same each month of the year. Another example would be the unit question. When calculating how long it will take for every square foot of land to be covered by people when there is a continuous growth of the population would need to be solved using $y = ke^{cx}$. Two assignments stood out to me when looking at which ones helped me grasp the concept of exponential functions. The

first one is *Working With Powers*. The exponential function $y = ke^{cx}$ has 'c' and 'x' as powers. To be able to use this formula, I needed to practice how to simply different forms of powers, which this worksheet helped me practice. It gave me problems like $2a^2 * a,\ 3a^3 * 3a^3 * 3a^2,\ (m^3)^3,\ 2n^0/n,\ and\ 2x^2y^3/2y^2$ to practice with. The second assignment that helped prepare me to solve the unit question is *The Limit of Their Generosity*. This worksheet introduced the skill of taking different compound intervals, the number of intervals, and the amount of interest per interval and plug and chug to find how much the final amount is. This was a major stepping stone that taught me how to use the formula $y = ke^{cx}$ in different scenarios.

Linear equations represent starting points as 'b'. In the equation y = mx+b if you plug in zero for x, you will be left with b, which is the y-intercept/initial value. In the exponential function $y = ke^{cx}$, the starting point is being represented by k. If you plug zero for x again, you will be left with k, the initial value.

Selection of Work:

Points, Slopes, and Equations - This worksheet helped me practice finding linear equations when given either a pair of coordinate points or a slope and a singular coordinate point.

What's It All About?, - This assignment introduced the general concept of derivatives and the formula used to calculate it (y2-y1/x2-x1).

Slippery Slopes - Slippery Slopes provided me with the opportunity to practice and master calculating the derivative and proportionality constant.

ZOOOOOOOOM - This worksheet gave me practice on finding the slope of a line and determining what that slope meant.

On a Tangent - This assignment introduced the idea of a tangent line and how to find the derivative of that specific line.

Speeds, Rates, and Derivatives - This worksheet allowed me to practice how to find the derivative of a line and then determine what that number means.

The Power of Powers (Continued) - This assignment introduced the concept of proportionality constants to me.

POW #2 - This POW helped me practice how to write formulas for certain situations.

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Reflection:

- What changes or growth have you noticed so far during your junior year in your ability to work well in groups?

Ever since I can remember, I struggled with the idea of not understanding something right away and not being able to get the right answers. So far, this year in math 3, I have had to push myself out of my comfort zone by allowing myself to show that I don't understand something. I struggled with a few small concepts at the beginning of the year, partly because of the different teaching styles as well as because it was new content that I hadn't seen before. I got very used to previously knowing how to do the math in my 9th and 10th-grade math classes since I have been in advanced math since middle school. This year made me realize how much I expected to walk into math class and already know how to solve the problems given to me which hurts me more than helps in the long run.

- How do you feel about your work in this unit? Do you feel proud or embarrassed?

Overall, I feel proud of my work during this unit. I made sure that I completed all the classwork and homework given out. Sometimes I struggled with fully completing a few assignments because I didn't understand the content at the time, but when that type of situation arose, I made sure to talk it through in class the next day until I was able to grasp an understanding. To me, my grade is just as important as my learning because I feel it will help drive me in the direction I want to go in the future. I often find myself prioritizing my 'A', but this year when I was all of a sudden faced with content that took more energy to learn made me realize that sometimes not getting as close to 100% as possible teaches me more of a lesson than always getting the perfect grade.

- What have you learned about your learning style? How do you learn the material best, given the variety of activities in this unit?

This unit emphasized that I work best in group atmospheres. Being in a group with my peers helps me learn new or forgotten content easier. Being able to talk through problems and possible solutions help the information being given sink in more for me. Another huge part of group work for me is, being able to help/teach others. This not only helps my classmates learn but it also helps me solidify the concepts in my own brain.

- How have you grown as a mathematician in this unit? How have you developed your Habits of a Mathematician?

A Habit of a Mathematician that I grew in during this unit is, identifying and applying appropriate mathematical tools. I learned and practiced how to identify which problems are linear equations and which ones are exponential functions. This allowed me to get comfortable with the difference between the two as well as helped me practice how to transfer information from a word problem to either of the equations and be able to solve it.