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Math 135

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March 1st, 2019

 Math Project #1

For this math project we were asked to create two different graphs based on data sets we found on Google. For our linear graph data points, we chose to do ours on how much a plant grows over nine days. From looking at our graph we can see a constant growth rate of four millimeters in two days. The growth rate for our linear graph is increasing at an increasing rate. The next group of data points were suppose to represent exponential growth. Our group decided to choose population for the Houston Metro Area since 1990. This graph is increasing at an increasing rate as well. The growth rate is also increasing at a constant percentage change which is needed to have an exponential graph.

Some key differences regarding linear and exponential functions are that a linear function is written following the y=mx+b format and exponential functions follow the y=bm^x. So the b is shifted in front of the m in the exponential functions and the x becomes an exponent to the m. Besides the written form of the formulas themselves, the main difference between these two functions is that a linear function changes at a constant rate as x changes and an exponential function changes at a rate proportional to the value of the function.

A few apparent variations of graphs for linear and exponential functions are that linear graphs are straight lines with no curvature while exponential graphs are curved. This is due to the fact that linear functions grow at constant rates and exponential functions increase over time. Both graphs can go upwards or downwards to represent increasing or decreasing values.

 The difference between exponential and linear growth is found in the way that it is measured. A linear function uses slope which requires a constant rate of change to be present. An exponential function does not use constant slope but rather percent change which measures how a variable increases or decreases. Percent change is used for exponential functions to mirror the change in the y value regarding the change in x.

Exponential and linear growth is represented in a number of real world scenarios. One such scenario being budgeting for savings, which is linear. For example, Sarah has $100 dollars a month extra to put in her savings account, if she does this at a constant growth rate each month she will end up with $500 dollars in her savings after five months, which is linear growth. An example of exponential growth would be bank accounts that accrue interest. For example, if someone puts $10 dollars in their bank account with 10 percent interest every month, it will increase by the same percent change each month but not by the same amount, which is exponential growth.

For a data set to have a linear trend, the line needs to be increasing or decreasing at a constant rate. Our graph represents this linear trend by increasing four millimeters every two days. The linear trend should also be very close to a straight line. This gives us a visual evidence that our graph is a linear graph. Our graph matches the examples given in class, demonstrating a true linear function. On the other hand, for a data set to have an exponential trend the line will have curvature either in a positive or negative direction. Exponential trends need to have a constant percent change whether it is positive or negative. We looked at many exponential graphs in class, and ours matches the examples given.

After concluding this project, we found that linear and exponential functions are similar in that they both have constant aspects to them, the percent or the slope, but that the linear function is always constant as it increases at a constant rate while the exponential function increases at a changing rate but with the same percent. Both of these terms prove helpful to understand, especially when applied to real life. For instance, it is helpful to understand that a bank account that accrues interest at a 10% rate each month is much different than one that accrues interest at a rate of $10 dollars a month. The exponential account will accrue money much faster than the linear one. The bigger the percent interest, the more money you will make. This is also helpful to understand because the more money you put into an account, the larger the amount of money will be included in the percent. 10 percent of $20 dollars is less than 10 percent of $30 dollars.

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| --- | --- |
| Day | Height (mm) |
| 1 | 0 |
| 3 | 4 |
| 5 | 8 |
| 7 | 12 |
| 9 | 16 |



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| --- | --- |
| Years | Population  |
| 0 | 184 |
| 10 | 236 |
| 20 | 332 |
| 30 | 528 |
| 40 | 737 |
| 50 | 1070 |

