MATH133: Unit 5 Individual Project

In this assignment you will study an exponential function that is similar to Moore's Law that was formulated by Dr. Gordon Moore, cofounder and Chairman Emeritus of Intel Corporation.

The following is a table representing the number of transistors in Intel CPU chips between the years 1971 and 2000:

Processor	Transistor Count	Year of Introduction
Intel 4004	2,300	1971
Intel 8085	6,500	1976
Intel 80286	134,000	1982
Intel 80486	1,180,235	1989
Pentium Pro	5,500,000	1995
Pentium 4	42,000,000	2000
Core 2 Duo	?	2006
Core 2 Duo and Quad Core + GPU Core i7	?	2011

If *x* equals the number of years after 1971 (the year 1971 means x = 0), then these data can be mathematically modeled by the exponential function $y = f(x) = 2{,}300(1.4^x)$.

For each question, be sure to show all your work details for full credit. Round all value answers to three decimal places.

1. Graph your function using Excel or another graphing utility. (For the graph to show up in the viewing window, use the *x*-axis scale of [-10, 40], and for the *y*-axis scale, use [-10,000,000, 50,000,000]). (There are free downloadable programs like Graph 4.4.2 or Mathematics 4.0; or, there are also online utilities such as this site and many others.) Insert the graph into the supplied Student Answer Form. Be sure to label and number the axes appropriately so that the graph matches the chosen and calculated values from above.

2. Based on this function, what would be the predicted transistor count for the years 2006 and 2011? Show all the work details.

3. Using the library or Internet resources, find the actual transistor count in the years 2006 and 2011 for Intel's Core 2 Duo and Quad Core + GPU Core i7, respectively. Compare these values to the values predicted by the function in part 2 above. Are the actual values over or under the predicted values and by how much? Explain what this information means in terms of the mathematical model function $y = f(x) = 2{,}300(1.4^x)$. Be sure to reference your source(s).

4. Examine the connection between the exponential and logarithmic forms to your problem. First, for $y = b^x$ if and only if $x = \log_b y$, both equations give the exact same relationship among x, y, and b. Next, use the rule of logarithms $\log_b \frac{M}{N} = \log_b M -$

$\log_b N$. Applying the given relations, convert the function y = f(x) = 2,300(1.4^x) into logarithmic form.

5. Then, examine the function y = g(x) = $\log_{1.4}$(x) − $\log_{1.4}$2,300. Discuss and demonstrate the relationship between the functions y = f(x) and y = g(x).

6. In the mathematical model function y = f(x) = 2,300(1.4^x), replace 2,300 with a chosen number between 1,390 and 1,960. (For example, y = f(x) = 1,400(1.4^x) uses 1,400 for the chosen value). How well does this new mathematical model match the given data in the table above? What does this tell you about the mathematical model function y = f(x) = 2,300(1.4^x)?

References

Desmos. (n.d.). Retrieved from https://www.desmos.com/

Graph 4.4.2. (n.d.). Retrieved from the Graph Web site: http://www.padowan.dk/

Mathematics 4.0. (n.d.). Retrieved from the Microsoft Web site: https://www.microsoft.com/en-us/default.aspx