Matteo Iaconetti

40130741

COMP 354-BB

**Project Notes**

* Underline means possible glossary term.

**Collaboration Patterns**

Weekly Meetings: Sundays at 3:00 pm

Realized through Discord, which is also used to exchange messages and contact other members

Sharing code and programs through online GitHub service and Overleaf

Zoom meetings during lab time on Fridays at 9:15

Documenting meetings and shared information in Google Docs

**Exponential Function**

*y = abx* is an exponential function, where *b* is defined as the base and is any real constant number where *b* > 0 and *b* ≠ 1 [1]. *a* is any constant real number where *a* ≠ 0 [1]. And *x* is any real variable, defined as the independent variable [2]. In exponential functions, the rate of change changes over time, with the rate of growth either becoming faster or slower depending on the value of the base, *b* [3].

The features of exponential functions are:

* Domain is all real numbers.
* Range is all real numbers, excluding 0.
* For *b* > 1, the function increases, meaning the values of *y* grow in value.
* For 0 < *b* < 1, the graph decreases meaning the values of *y* decrease in value.
* The function can approach but never reach the value of 0. [1]

The exponential function works by multiplying the base, *b*, by itself, *x*, number of times, where *x* is the input of the function. Exponential functions don’t have a constant rate of change, but instead have constant ratios, meaning they grow by common factors over equal intervals [1]. For example, the function y = 2x (seen in Figure below) displays an exponential growth, where the value is doubled for every 1 interval of *x*, which is usually any unit of time, and increases rapidly [2].

Chart, line chart

Description automatically generated

**Figure**: Graphical representation of the function y = 2x, which is an example of exponential growth. [1]

**Glossary**

Base: used to refer to a particular mathematical object that is used as a building block [4].

Domain: the set of input values for which a function is defined [5].

Exponential: containing an exponent; a number or sign that shows how many times another number is to be multiplied by itself [6].

Exponential Growth: a pattern of data that shows greater increases with passing time, creating the curve of the exponential function [7].

Function: a relation from a set of inputs to a set of possible outputs, where each input is related to exactly one output [8].

Independent Variable: represents a quantity that is being manipulated, the inputs of the function [9].

Range: The set of values a function outputs [5].

Rate of Change: Is used to mathematically describe the percentage change in value over a period of time; the speed at which variables change over a specific period of time (Chen "Rate of Change (ROC)").

Rate of Growth: refers to the percentage change of a specific variable within a specific time period [11].

Real Number: any number where all arithmetic operations can be performed and can be represented in the number line. Excludes any imaginary numbers [12].

Variable: a symbol, usually a letter standing in for an unknown numerical value in an equation [13].

Subordinate Function: a simpler or smaller function used to evaluate the special functions included in the Eternity system, such as square root or factorial.

Special Function: the seven functions that are described within the report and to be included in the Eternity system; exponential, arccos, log, MAD, standard deviation, sinh and xy.

**References**

[1] D. Roberts, “Exponential Functions - MathBitsNotebook(A1 - CCSS Math),” *MathBitsNotebook*. https://mathbitsnotebook.com/Algebra1/FunctionGraphs/FNGTypeExponential.html (accessed May 22, 2021).

[2] D. Q. Nykamp, “The exponential function - Math Insight,” *Math Insight*. https://mathinsight.org/exponential\_function (accessed May 22, 2021).

[3] “Exponential Functions - Definition, Formula, Properties, Rules,” *BYJUS*. https://byjus.com/maths/exponential-functions/ (accessed May 24, 2021).

[4] E. W. Weisstein, “Base.” https://mathworld.wolfram.com/Base.html (accessed May 22, 2021).

[5] “Domain and Range | Boundless Algebra,” *Lumen Learning*. https://courses.lumenlearning.com/boundless-algebra/chapter/domain-and-range/ (accessed May 22, 2021).

[6] “exponential,” *Cambridge Dictionary*. https://dictionary.cambridge.org/dictionary/english/exponential (accessed May 22, 2021).

[7] J. Chen, “What Is Exponential Growth?,” *Investopedia*, Apr. 30, 2021. https://www.investopedia.com/terms/e/exponential-growth.asp (accessed May 22, 2021).

[8] D. Q. Nykamp, “Function definition - Math Insight,” *Math Insight*. https://mathinsight.org/definition/function (accessed May 22, 2021).

[9] D. Q. Nykamp, “Independent variable definition - Math Insight,” *Math Insight*. https://mathinsight.org/definition/independent\_variable (accessed May 22, 2021).

[10] J. Chen, “Rate of Change (ROC),” *Investopedia*. https://www.investopedia.com/terms/r/rateofchange.asp (accessed May 24, 2021).

[11] J. Chen, “Growth Rates,” *Investopedia*. https://www.investopedia.com/terms/g/growthrates.asp (accessed May 24, 2021).

[12] “Real Numbers- Definition, Properties, Set of Real Numerals,” *BYJUS*. https://byjus.com/maths/real-numbers/ (accessed May 22, 2021).

[13] T. E. of E. Britannica, “Variable | mathematics and logic,” *Encyclopedia Britannica*, Oct. 10, 2012. https://www.britannica.com/topic/variable-mathematics-and-logic (accessed May 22, 2021).