

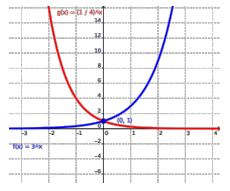


Algebraic and Transcendental Functions

Exponential Growth and Decay: Multicultural project
2nd Partial

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Part I: Make a visual / graphic summary where they clearly show and explain the basic graph that represents an exponential function that includes its reference point, its domain and its range.

	Equation	Basic Graph	Shape	Basic Characteristics
Exponential Growth	$y=3^x$		Half a parabola approaching the axis.	It is a continuously rising curve. It changes depending on the variables added to the equation.

Exponential growth is the acceleration of the increasing number or size in proportion to a constantly growing rate. It is when the original amount is now growing at the same rate within an amount of time. Exponential growth can be used to determine the values of investments, values of retail, and much more.

The shape of the exponential growth's graph is a simple half parabola approaching the axis, but it will change, according to the numbers that are entered, either into a wider or narrower graph. Since we are talking about exponential growth, it will be a continuously rising curve. There can also be exponential decay, which would be the same but instead of increasing, it would now be decreasing.

Part II with the summary of the Chernobyl Nuclear Disaster and at least two different real events / situations that are also examples of exponential growth and decay. Also include, evidence of the team's interaction and form or work.

In April 26 of 1986 Chernobyl suffer a major nuclear explosion. Chernobyl is located at the northern part of Ukraine, and where the Chernobyl nuclear power plant is found. This power plant was built in the 1970's with the purpose of producing electric power. It was composed of 4 reactors. Previous to this disaster, it was planned to shut down the reactor number 4 and see how much time could the power plant keep working. This was under the directions of Moscow.

What happened first was that the extremely hot nuclear fuel was lowered as mechanisms where disabled which release a huge amount of steam, that further caused the explosion of reactor number 4 and the release of radiation into the atmosphere.

After the explosion, the government of Ukraine held an investigation to know the causes of the explosion, and simultaneously the evacuation of population started. However, the release of radiation affected the health of many, and even deaths. The most common symptoms in people were vomiting, headaches, fever, hair loss, and diseases such as thyroid cancer increased in Ukraine.

Thanks to the strong winds at that time, made radiation to travel from south to east, Radiation of the explosion not only affected humans, but also animals and plants. It killed many of trees, and changed their appearance to a ginger color because of high levels of radiation. Now a days, in Chernobyl, it can be found many unique species, that is thought there have adapted to high levels of radiation since in their bodies contain high levels of Cesium-137.

CASE 1

Atmospheric pressure

It decreases 12% every 1000m

The pressure at sea level is 1013 hPa

Find the pressure on the roof of the Empire State Building (381 m), and at the top of Mount Everest

(8848 m)

Formula

$$y(t) = a \times e^{kt}$$

Facts:

a (the pressure at sea level) = 1013 hPa

In this case t is in meters (distance, not time)

y(1000) is a 12% reduction on 1013 hPa = 891.44 hPa

$$a = 1013$$

$$t = 1000$$

$$891.44 = 1013 e^{k(1000)}$$

Divide both sides by 1013: $0.88 = e^{1000k}$

Take the natural logarithm of both sides: $\ln(e^{1000k})$

$$\ln(0.88) = 1000k$$

Switch sides

$$1000k = \ln(0.88)$$

$$\text{Divide } k = \ln(0.88)/1000$$

$$K = \ln(0.88)/1000$$

Formula

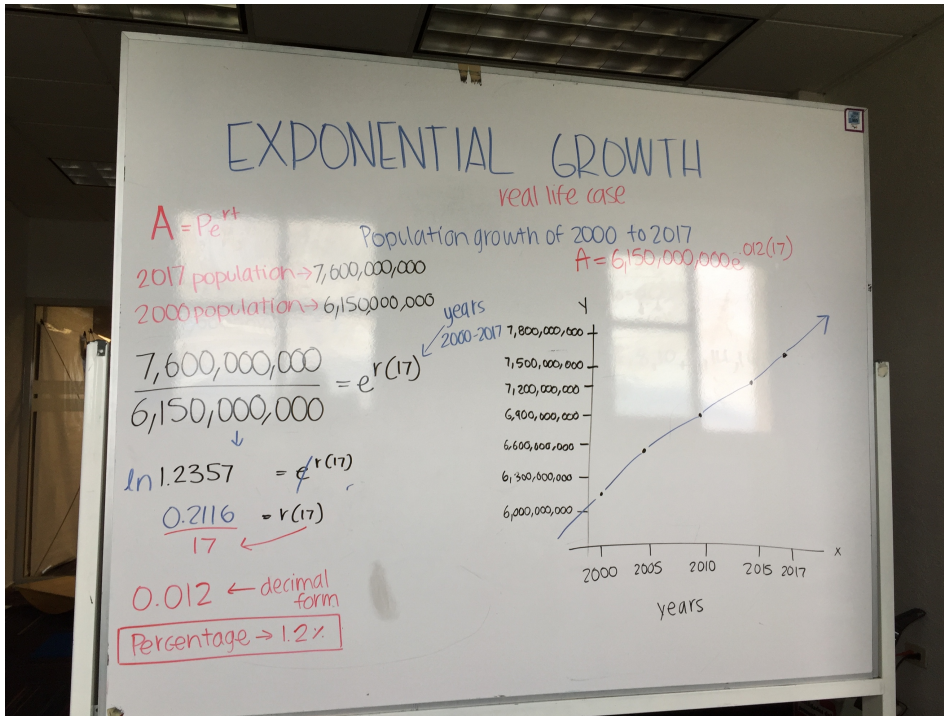
$$y(t) = 1013 e^{(\ln(0.88)/1000) \times t}$$

$$y(381) = 1013 e^{(\ln(0.88)/1000) \times 381} = 965$$

$$y(8848) = 1013 e^{(\ln(0.88)/1000) \times 8848} = 327$$

CASE 2

Population growth



$$a = 7600000000$$

$$p = 6150000000$$

$$t = 17$$

$$r = ?$$

to find r we need to isolate for it

$$7600000000 = 6150000000e^{r(17)}$$

$$\frac{7600000000}{6150000000} = e^{r(17)}$$

$$\ln 1.2357 = \ln e^{r(17)}$$

*e is canceled

$$\ln 1.2357 / 17 = r$$

$$r = 1.2$$

To graph and see visually the population growth it is needed (now that we have a complete formula) to replace in the value of t with year we are looking up the population)

$$A = 6150000000e^{(0.012)(5)}$$

$$A = 6150000000e^{(0.012)(10)}$$

$$A = 6150000000e^{(0.012)(15)}$$

$$A = 6150000000e^{(0.012)(17)}$$

5 years → 6530294761
10 years → 6934105637
15 years → 7362886783
17 years → 7600000000

1. INTRO DEL VIDEO **NOMBRES, MATRICULAS CAMPUS E INTRUDUCCION**
2. EXPLICAR TODO SOBRE EXPONENTIAL GROWTH & DECAY!!! CON GRAFICA
3. REAL LIFE EXAMPLE OF MOUNTAIN EVEREST, DESARROLLARLO TOTALMENTE Y PROBARLO CON FACTS (DECAY)
4. CASO DE CHERNOBYLL TODO DESARROLLADO
5. EXPLICAR EL CASO REAL DE EXPONENTIAL GROWTH RELACIONADOLO CON CHERNOBYLL
6. CONCLUSION TODAS!

DIÁLOGO DEL VIDEO

HI!

My name is Sara Arias and I'm a third semester student in campus Cumbres.

My name is Mariana Diaz and I'm a third semester student in campus Cumbres.

My name is Eugenia Garza and I'm a third semester student in campus CSC.

My name is Verónica Clariond and I'm a third semester student in campus CSC.

This video will contain the description of the concept exponential growth and decay. We will add the use of graphs for a visual understanding of exponential functions activity.

We will explain two real life cases where exponential functions are implemented, one with a constant increment and one of decay.

Also, we are giving brief summary of Chernobyl's Nuclear Reactor Disaster to this day and in a global context.

This video has the purpose of a total knowledge of exponential functions.

PART 1-INFO-

An exponential function in a mathematical way is written as $f(x) = a^x$ "f of x equals base a to the second power" Where "x" is a variable and "a" is a constant called the base.

Exponential growth is the acceleration of the increasing number or size in proportion to a constantly growing rate. It is when the original amount is now growing at the same rate within an amount of time.

Exponential growth can be used to determine the values of investments, values of retail, and much more.

The shape of the exponential growth's graph is a simple half parabola approaching the axis, but it will change, according to the numbers that are entered, either into a wider or narrower graph. Since we are talking about exponential growth, it will be a continuously rising curve.

There can also be exponential decay, which would be the same but instead of increasing, it would now be decreasing.

PART 2-INFO-

Mountain Everest example

PART 3

As most people know in April 26 of 1986 Chernobyl suffer a major nuclear explosion. Let me explain this in a more detailed way. Chernobyl is located at the northern part of Ukraine, and where the Chernobyl nuclear power plant is found. This power plant was built in the 1970's with the purpose of producing electric power. It was composed of 4 reactors. Previous to this disaster, it was planned to shut down the reactor number 4 and see how much time could the power plant keep working. This was under the directions of Moscow.

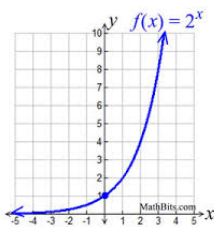
What happened first was that the extremely hot nuclear fuel was lowered as mechanisms were disabled which release a huge amount of steam, that further caused the explosion of reactor number 4 and the release of radiation into the atmosphere.

After the explosion, the government of Ukraine held an investigation to know the causes of the explosion, and simultaneously the evacuation of population started. However the release of radiation affected the health of many, and even deaths. The most common symptoms in people were vomiting, headaches, fever, hair loss, and diseases such as thyroid cancer increased in Ukraine.

Thanks to the strong winds at that time, made radiation to travel from south to east. Radiation of the explosion not only affected humans, but also animals and plants. It killed many of trees, and changed their appearance to a ginger color because of high levels of radiation. Now a days, in Chernobyl, it can be found many unique species, that is thought there have adapted to high levels of radiation since in their bodies contain high levels of Cesium-137.

Conclusion

2. What is the function and graph that models and represents it?



4. What is exponential decay?

Exponential decay describes the decrease of an amount over a period of time.

6. Do you consider nuclear energy to be clean energy? (justify your answer)

It can be considered as clean energy because it does not release or emit carbon into the air when energy is produced. Nuclear plants use fission instead of combustion to produce heat.

8. Where is it?

It is located in the city of Alto Lucero de Gutiérrez Barrios, Veracruz, México

10. Do you agree with the fact that there is a Nuclear Energy plant in your country? (Justify your answer)

We do not agree because even though there is a good effect in air pollution it has a higher danger rate, risk of having a bigger problem

12. Once the explosion happened, was there any way to stop the radiation spread and its pollution? Many specialists analyzed the case, and even though it is impossible to stop the spread of radiation, they started a project in which they would gain time and prevent more radiation from the nuclear plant spread. This project consisted in the construction of a sarcophagus that covered all the nuclear plant.

14. What are at least 4 environmental consequences (in a global scale) of the Chernobyl 1986 disaster?

16. What do you think and feel about these consequences?

we are amazed of how a good action, that consisted in improve human's life, ended up being a disaster affecting many innocent lives.

18. How did we feel working like this? Did we like it? Was it difficult? What did I like the most of working with my teammates in this form?

We learned a lot during this project. At the beginning we faced a little challenges because of the way we had to interact among all the team mates since we are in different places, but with collaboration and good communication we achieved our goal.

Conclusion

1. What is exponential growth?

Exponential growth is the development at an increasingly rapid rate in proportion to the growing total number or size. Or a constant rate of growth applies to a continuously growing base over a period of time.

3. What are their main characteristics? (include a picture of your team's visual / graphic summary)

Two characteristics of functions that you should become comfortable with are domain and range. The domain is the set of inputs (x values) for which the function is defined. The range of a function is closely related to the domain. In addition to a mathematical equation, graphs and tables are another way to represent a function. Since a function is made up of two sets of numbers each of which is paired with only one other number, a graph of a function can be made by plotting each pair on an X,Y coordinate system known as the Cartesian coordinate system. Graphs are helpful because they allow you to visualize the relationship between the domain and the range of the function.

5. What are the implications of using nuclear energy?

1. Nuclear power generation does emit relatively low amounts of carbon dioxide (CO₂).
2. It is possible to generate a high amount of electrical energy in one single plant.
3. The problem of radioactive waste is still an unsolved one. The waste from nuclear energy is extremely dangerous and it has to be carefully looked after for several

thousand years (10'000 years according to United States Environmental Protection Agency standards).

4. High risks: Despite a generally high security standard, accidents can still happen. It is technically impossible to build a plant with 100% security. A small probability of failure will always last. The consequences of an accident would be absolutely devastating both for human being as for the nature. The energy source for nuclear energy is Uranium. Uranium is a scarce resource, its supply is estimated to last only for the next 30 to 60 years depending on the actual demand.

7. Are you aware that there is a Nuclear Energy Plant in Mexico?

We were not aware there was a Nuclear Energy Plant in Mexico until we did the investigation for this project. In the next questions we will discuss the topic.

9. Do you think it is safe?

We don't think it's safe because the radioactive waste from nuclear energy is very dangerous and it has to be carefully revised after for several thousand years.

11. Could the Chernobyl 1986 nuclear disaster have been prevented? How?

The Chernobyl accident occurred during a test run, which was conducted to improve plant safety. This accident proved once more what experienced control engineers have all learned: that a process must be understood before it can be controlled.

Poorly trained, uninformed and were operating the plants under manual control while their safety controls were bypassed

13. Do you think that the radioactive pollution generated by this disaster reached Mexico? (Justify your answer).

No, because the radioactive pollution reached Belarus, which is 828.3 km from Ukraine. That was more or less the farthest place it reached, and Mexico is 10,799 kilometers from Ukraine.

15. What are the environmental consequences (in a global scale) of other nuclear disasters and use of nuclear weapons?

Consequences in the environment by nuclear disasters are making certain amount of pollution in marine ecosystems and also they impact on a population where the disaster took place in terms of making people suffer a drastic increase of thyroid cancer as a result of the population's exposure to extremely high doses of radiation.

17. What would be a solution proposal for this situation?

This should be a drastic proposal because of the size of the problem so we agreed that the best proposal would be a really tight security system where they have the knowledge to overcome problems and quickly take care of any damages.

Conclusion and solution

In conclusion, we know an exponential growth is the development at an increasingly rapid rate in proportion to the growing total number or size. Or a constant rate of growth applies to a continuously growing base over a period of time. Also, we learned extra characteristics of its activity like, the domain is the set of inputs (x values) for which the function is defined. The range of a function is closely related to the domain. In addition to a mathematical equation, graphs and tables are another way to represent a function. Since a function is made up of two sets of numbers each of which is paired with only one other number, a graph of a function can be made by plotting each pair on an X,Y coordinate system known as the Cartesian coordinate system. Graphs are helpful because they allow you to visualize the relationship between the domain and the range of the function.

This type equation can be used in energy, population growth, human memory and other real life cases. In this project we are based on the case of the Chernobyl's nuclear bomb and its spread of radiation.

Nuclear plants are very dangerous and difficult to treat. In Mexico we have a nuclear plant located in Alto Lucero de Gutiérrez Barrios, Veracruz, Mexico and even though nuclear plants are beneficial for air pollution it has a high risk of turning into a bad event like Chernobyl's nuclear explosion, which ended with many people's life. For this, we are not in favor of nuclear plants in Mexico.

It is sad to hear Chernobyl's accident could have been prevented but as the test run was poorly trained and unformed they lost control. Many specialists analyzed the case, and even though it is impossible to stop the spread of radiation, they started a project in which they would gain time and prevent more radiation from the nuclear plant spread. This project consisted in the construction of a sarcophagus that covered all the nuclear plant.

This event brought various consequences in the environment as pollution in marine ecosystems and also they impact on a population where the disaster took place in terms of making people suffer a drastic increase of thyroid cancer as a result of the population's exposure to extremely high doses of radiation.

As a team, we ended up thinking the same way for a logical solution of nuclear plants. We already know, that energy plants have a good effect in air pollution so, it is fine to have them but, it would be a lot less risky to have them far away from society. So, if there is a major problem it won't affect or cause deaths of people.

When we were analyzing the project we realized how much we have learned, not only within the education but also to know how to communicate and interact with people far from you. The use of the technical tools made us very helpful. At the beginning we faced small challenges because of the way we had to interact among all the team mates since we are in different places, but with collaboration and good communication we achieved our goal.

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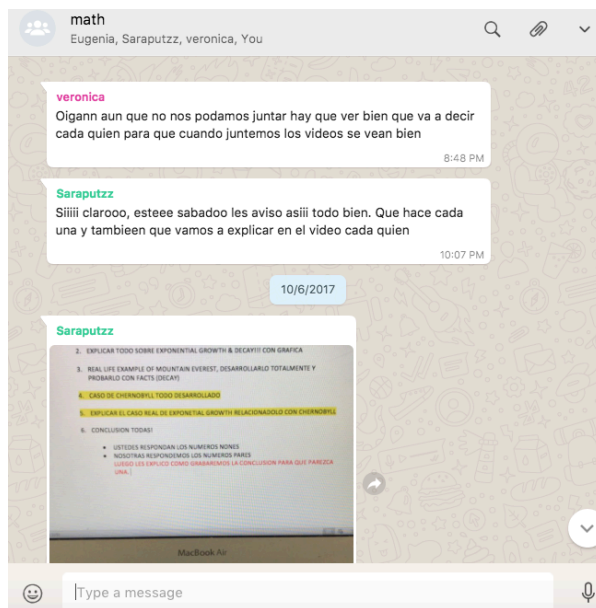
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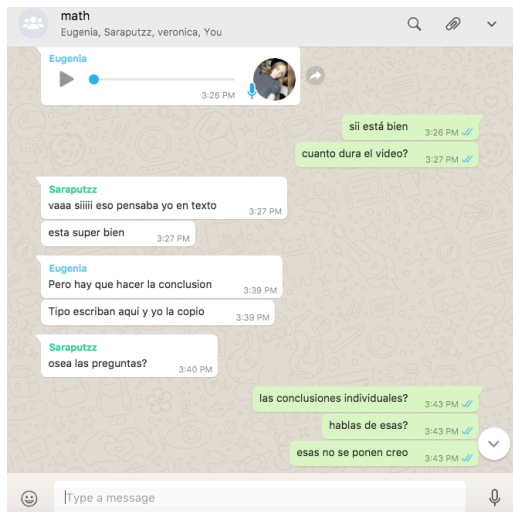
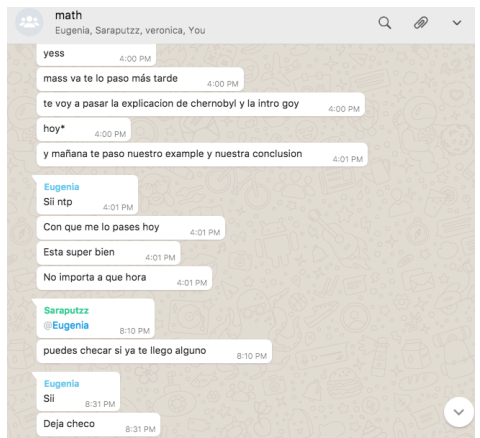
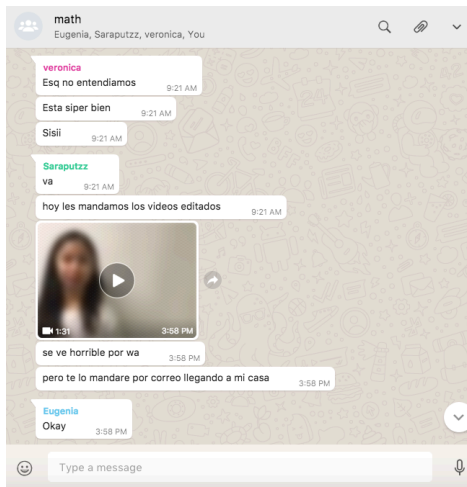
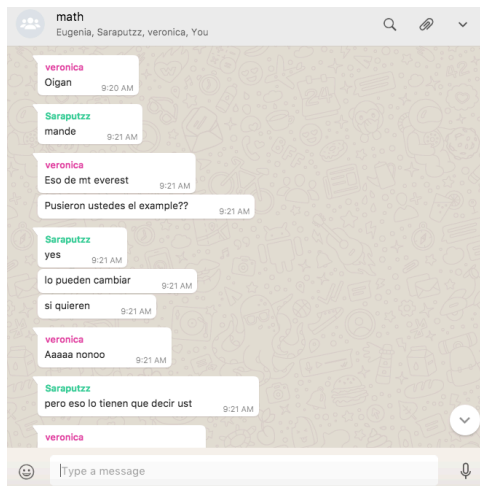
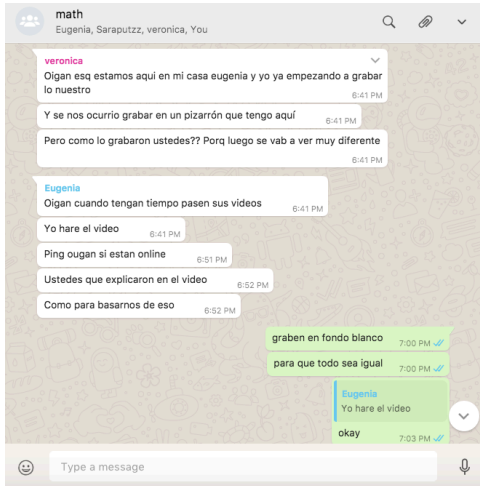
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Evidence





Rubric

Name: _____ Id#: _____ Group: _____		
Percentage	Product	Points
5%	Video's clarity and quality of image and sound. All team members actively participate in equal portions of the video.	
5%	Communication of ideas, theory, concepts, facts, summaries and explanations is clear and correct. Evidence of team members interaction is included.	
5%	Use and expression of mathematical notations, symbols and representations (both oral and written expressions) is clear and correct.	
10%	Introduction: Name, Id#, Campus and brief summary of project.	
20%	Part I: Visual / graphic summary of the graph that represents exponential functions with all of its elements.	
20%	Part II: Summary of Chernobyl disaster and at least 2 examples of exponential growth and decay with two other real events / situations.	
35%	Conclusions: Answers to all questions and solution proposal.	
Total Points:		