

Exponential vs. Logistic Growth

{Human Population

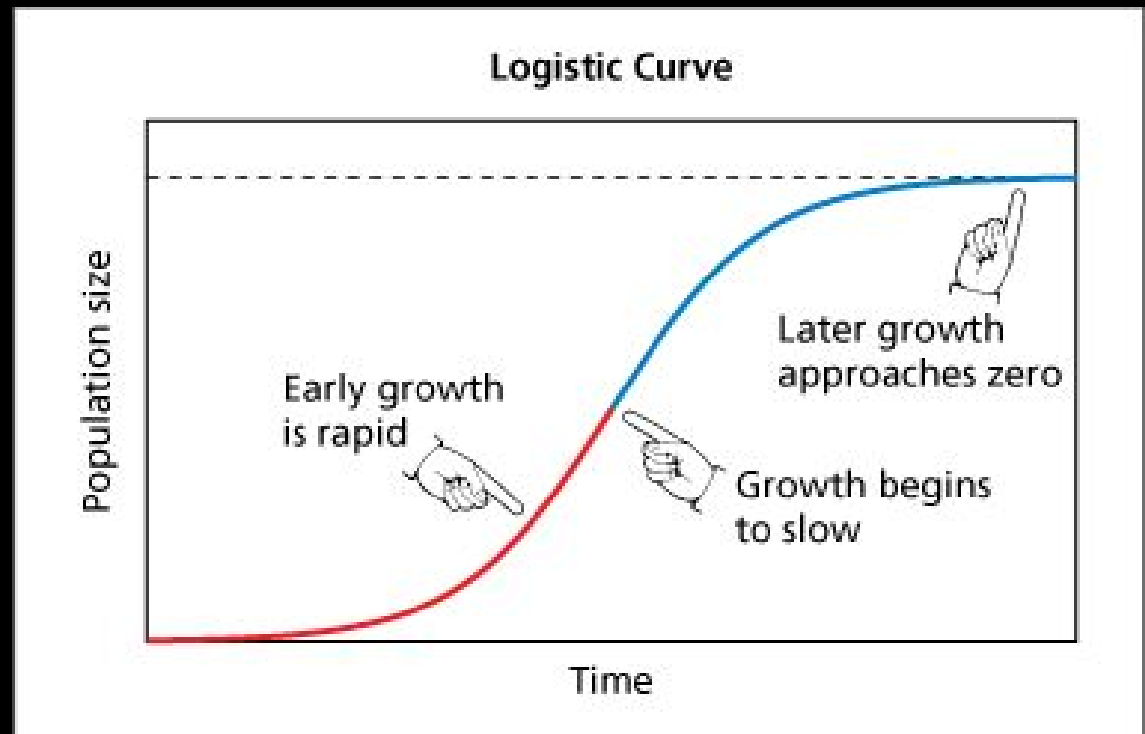
Exponential vs. Logistic Growth

Self-reproduction is the main feature of all living organisms. This is what distinguishes them from non-living things. Any model of population dynamics include reproduction. We will discuss two most important models of population growth based on reproduction of organisms: exponential and logistic models.

Logistic Growth

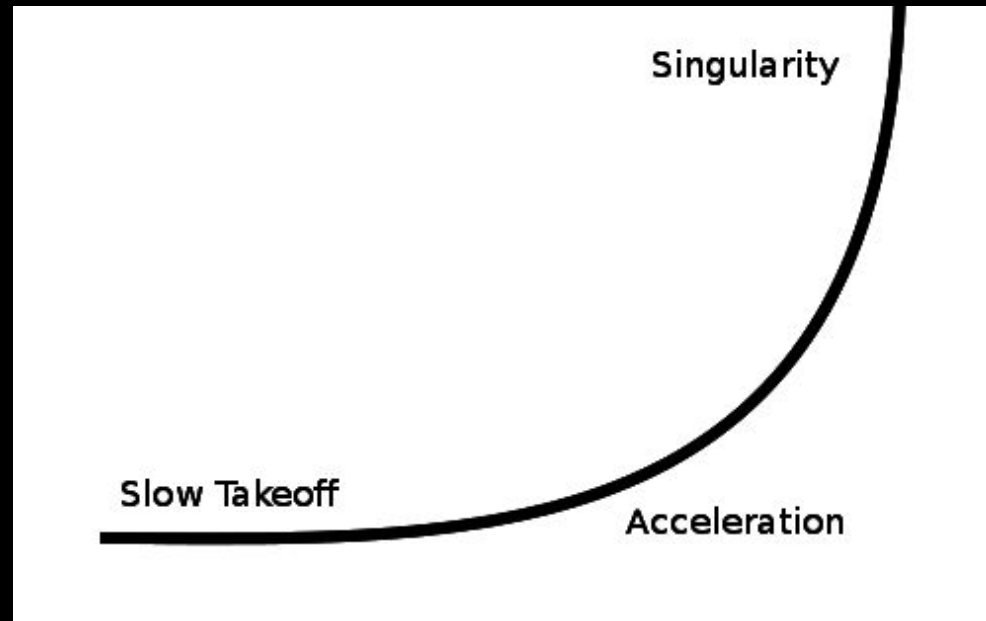
In a population showing exponential growth the individuals are not limited by food or disease. However, in most real populations both food and disease become important as conditions become crowded. There is an upper limit to the number of individuals the environment can support. Ecologists refer to this as the "carrying capacity" of the environment.

Populations in this kind of environment show what is known as logistic growth.



Exponential Growth

Is the development at an increasingly rapid rate in proportion to the growing total number or size; a constant rate of growth applied to a continuously growing base over a period of time



Exponential or Logistic Growth?

- You charge \$500.00 on your credit card and it has interest rate of 20%
- You make the minimum payment of \$50.00, so \$90.00 of interest is added.
- The next month you now owe \$540.00. Again you make the minimum payment of \$50.00, so \$98.00 of interest is added.
- The next month you now owe \$588.00

Exponential or Logistic Growth?

- A small population of deer move into an area with lots of food.
- Because they have plenty of food they have lots of babies quickly.
- Eventually a lot of the food disappears, this makes it harder for the deer to survive.

- Many types of bacteria reproduce by splitting into two new cells.
- One type of bacteria can double every hour.
- If you start with one bacteria, by the end of the day you will have over 16 million

- You put \$100 in a bank account that pays a 5% interest rate every month.
- After the first month you have \$105
- After the second month you have \$110.25
- After the third month you have \$115.75
- After the fourth month you have \$121.54
- After the fifth month you have \$127.62

- A few prairie dogs make their home in a field
- There are no predators to eat them so their population increases.
- Four hawks decide to build nests near the field and start eating the prairie dogs

- A little algae starts growing on the top of a pond.
- There are a lot of nutrients so the algae is able to grow quickly.
- Eventually the entire pond becomes covered with the algae, so there is no more space for it to grow.

- In 1985, there were 285 cell phone users in a small town.
- Every year the number of users increased by 75%.
- So in the second year there was 499 users.
- In the third year there was 873 users
- In the fourth year there was 1528 users
- In the fifth year there was 2674 users

- Mold starts growing on a loaf of bread.
- Eventually the entire bread is covered with mold.

On a separate piece of paper

1) Describe the curve for the exponential graph.

(Sentence Starter: The exponential curve starts growing _____ and then _____)

2) Describe the curve for the logistic growth graph.

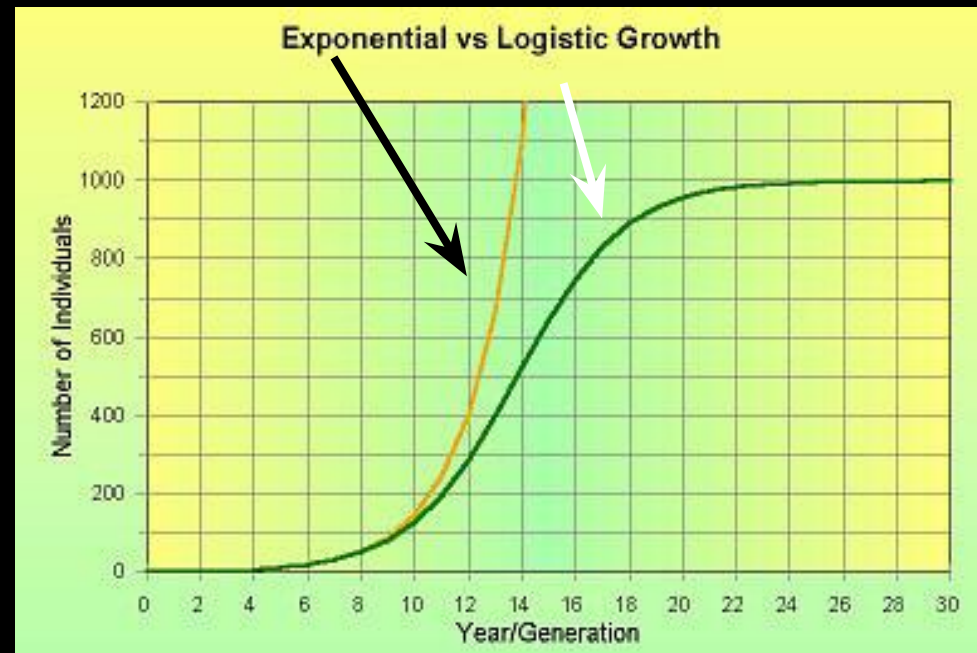
(Sentence Starter:

The logistical

curve starts growing

_____ and then

_____)



POPULATION ECOLOGY



ECOLOGY

Copy this table

Read the graph to figure out how many individuals were in the population for that year.

	Number of Individuals	
Year	Exponential	Logistic
4		
8		
12		
14		
16	(guess based on the direction the graph is heading)	
20	guess based on the direction the graph is heading)	

Exponential vs Logistic Growth



Answer these questions

4) Using your answers for questions 1-3, explain the **similarities** you found between exponential and logistic growth. Sentence Starter: The exponential and logistic growth graphs both

5) Using your answers for questions 1-3, explain the **differences** you found between exponential and logistic growth. Sentence Starter: The exponential and logistic growth graphs are different

Answer these

6) Is the human population growing following an exponential or a logistic graph? Use claim, evidence, and reasoning.

Sentence Starter: The human population is growing following _____. The human population is growing _____ because....(your evidence)

Your CER should talk about what you saw in the “World in Balance” video and on the graph.