5.1 Local Population Growth

Calculator   10 points

Name _____

Due Date _____

Population growth is an exponential function:

Population = (initial population)*e[(growth rate)(time)]

Or, in mathmaticalese

$$N=N_0e^{(bt)}$$

The "e" in both these equations is a wonderful number 2.71828…. It is sort of like pi. N is the Population, N_0 is the starting population, b is the growth rate in decimal form and t is time.

First of all, confirm that you can use your calculator correctly. Calculate e^8. You should get 2981.

1. What is e^5?

Remember that you normally you calculator will do the order of operations of the exponent first. You if you have a population growth rate of 14% over 15 years, you will want your calculator to tell you $e^{(0.14*15)}$ and not $e^{(0.14)}*15$). So you will need to make sure you can use parentheses to have the growth rate and time be multiplied first. So if you calculate $e^{(0.14*15)}$ you should get 8.17.

2. What is $e^{(.04*50)}$?

This brings up an important point. Most growth rates are given in percentages, and your calculator needs decimals. So if you are using a growth rate of 10% you will plug 0.1 into your calculator. If you are using a growth rate of 4%, you will enter 0.04 into your calculator.

3. What is the decimal form of 6%?

4. What is the decimal form of 3.2%?

Now that you know how to use your calculator, we can try solving simple population growth problems. For instance, if the initial population is 15,000 and the growth rate is 4%, in 12 years the population will be 24241. This is because $N=N_0e^{(bt)}$ and N_0 is 15,000, b is 0.04, and t is 12. So $N=15000*e^{(0.04*12)}=24241$

5. If the initial population of a country is 1 million and the growth rate is 3%, what will the population be after 25 years? (Show your work)

6. Make up your own question in which you give the initial population, the growth rate and the amount of time and have to solve for the ending population. Write it out and then solve it. (Show your work)

Question:

Solution:

In some cases we will want to find the growth rate. In this case we will need to rearrange the equation to isolate b.

$N = N_o e^{(bt)}$

Dividing both sides by N_o

$$\frac{N}{N_o} = e^{bt}$$

To solve for b, we need to take the natural log of both sides so

$\ln(\frac{N}{N_0}) = \ln(e^{bt})$ but since the natural log is the inverse function of e, this is just

$\ln(\frac{N}{N_0}) = bt$

And then we can get the equation for b by dividing by t.

$$\frac{\ln(\frac{N}{N_0})}{t} = b$$

7. So, if you have a town that had a population of 10,000 in 1990 and now has a population of 15,000 (its 2009), what has its growth rate been? (Show your work)

8. Make up your own question in which you determine the growth rate, and then solve your question. (Show your work)

Question:

Solution:

It is fairly straight-forward to solve the above equation for t, time. You might need to know this if you want to know how much time will pass before the population gets to a certain number. For example,

9. Island County in Washington (Which includes all of the San Juan Islands) has had a 1.3 percent growth rate since 2000. It currently has 79,300 residents. In how many years can the county expect to have 100,000 residents?

10. Make up a question where you give the growth rate and a current population and a target population and you have to determine the amount of time that will pass before hitting the target population.

Question:

Solution:

One last note… be careful of signs… there is such a thing as negative population growth!

5.2 Local Population Growth

(Internet, Word Processor)   10 points

Name _____

Due Date _____

In this assignment you will look at population growth for your city, county and the Puget Sound basin.

What city do you live in? _____

Use the internet to find the population of your city currently, and throughout its history. At the very least you should be able to get 2006/7 data, 2000, and 1990. For many cities, you will be able to get much more.

Write down the dates and population of your city.

Write the source of the information. You should list it in the following format:

> Author's name (last name, first and any middle initials). Date of Internet publication. Document title. <URL> or other retrieval information. Organization. "Accessed" Date of access.

If no author is listed use the publisher/organization as the author. For instance, if you used the City of Kent's website, the publisher is "City of Kent", and you would not include the organization later.

Use the technique shown in class to get the annual growth rate for your city.

Growth Rate:_____

5.2 Local Population Growth
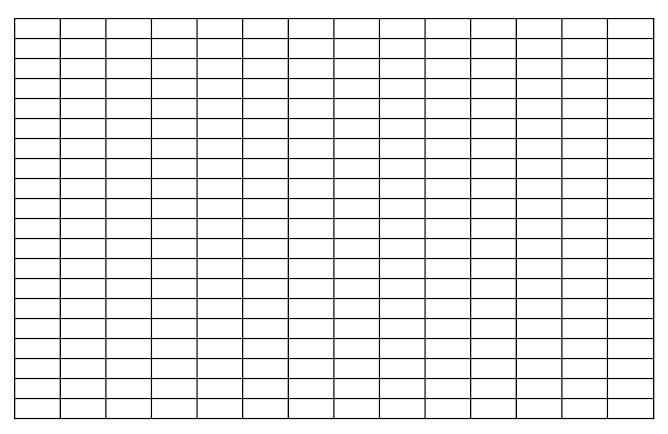(Internet, Word Processor)   10 points

Get the historical population data for your county from 1900 to 2000. Go to
http://www.census.gov/population/cencounts/wa190090.txt for the historical data. You
should be able to find 2000 and current populations on your own

Write the data down:

Now graph the data. Use an appropriate scale, with years on the bottom, county
population on the left side, and city population on the right side. Use different colors
and different scales for your county and city data.

5.2 Local Population Growth
(Internet, Word Processor)   10 points

Type and turn in 2-3 paragraphs about your data. You should include specifics about the history of growth in King County and your city. You should compare the two, again using specifics. In the final paragraph look toward the future if growth would continue as it has. What sorts of problems might be encountered?

At the end, please include correctly formatted references for your information. You should have at least 3 – one for the city info, the county historical data, and current county records.

5.3 Land Use Issues in your Neighborhood and City

(Internet, Word Processor)   10 points

Name _____

Due Date _____

In this assignment you will look at land use planning for your city.

What County do you live in? _____

What city do you live in? _____

What is your zip code? _____

Look at the current King County Comprehensive Plan. You can get it on-line at
http://www.kingcounty.gov/property/permits/codes/growth/CompPlan/2008.aspx . If
you live in Pierce County, go to
http://www.co.pierce.wa.us/xml/abtus/ourorg/council/code/title%2019a%20pcc.pdf

What is the current and projected number of households of your city given in the plan?
It is in chapter 2 of the King County document. (If you are in Pierce County, use
population)

If you are in King County, look at the original growth target for 2012 (which was
adopted in 1990) and the 2000 household data. How did your city do in meeting the
target half-way through the time?

Write the source of the information. You should list it in the following format:

> Author's name (last name, first and any middle initials). Date of Internet publication. Document
> title. <URL> or other retrieval information. Organization. "Accessed" Date of access.

5.3 Land Use Issues in your Neighborhood and City

(Internet, Word Processor)   10 points

Use the technique shown in class to get the annual projected household growth rate for your city.

Growth Rate:_____

How does this compare with the past population growth rate you found for your city in assignment 1.1? Do you think that the projected growth is reasonable? <u>Why?</u> Type your answer on a separate piece of paper.

Using the maps:

Look at the land-use map and zoom in on your city. Describe the current uses of the land and approximate percentages in your city.

How far do you live from the Urban Growth Boundary? (<u>Use the map's scale</u>)

Describe the land use within a mile radius of your house. (<u>Use the map's scale</u>)

Look at the Potential Annex Areas Map. Are you in or near a potential annex area?

5.3 Land Use Issues in your Neighborhood and City

(Internet, Word Processor)   10 points

Are there any community plans noted for your area in the comprehensive plan? What are some of the plans that your community has? What might be the impact of these?

Go to your City's website. Look for maps or other information on land use planning and future growth. If you need help finding this information, please ask/email. (Because each city's website is different I can't give better instructions). Look for a zoning map or a land use map or other maps that show you what the current and future plans for growth are in your city. Describe your neighborhood and what the future land-use issues look to be. Type this on a separate paper including references to any documents you use.