MODELING UTAH POPULATION DATA

Math 1010 Intermediate Algebra Group Project

According to data from the U.S. Census Bureau, Population Division, the population of Utah appears to have increased linearly over the years from 1980 to 2008. The following table shows the population in 100,000's living in Utah according to year. In this project, you will use the data in the table to find a linear function $f(x)$ that represents the data, reflecting the change in population in Utah.

Estimates of Utah Resident Population, in 100,000's

Year	1981	1989	1993	1999	2005	2008
x	1	9	13	19	25	28
Population, y	15.2	17.1	19	22	25	27.4

Source: U.S. Census Bureau, Population Division

1. Using the graph paper on the last page, plot the data given in the table as ordered pairs. Label the x and y axes with words to indicate what the variables represent.

2. Use a straight edge to draw on your graph what appears to be the line that "best fits" the data you plotted. You will only have one line drawn, rather than several pieces of lines

3. Estimate the coordinates of two points that fall on your best-fitting line. Write these points below.

   (13 , 19), (19 , 22)

   Use the points that you wrote down to find a linear function $f(x)$ for the line. Show your work!

$y = mx + b$ $\quad \frac{x_2 - x_1}{y_2 - y_1} = m$

$\frac{19-13}{22-19} = \frac{6}{3} = 2$

$19 = 2(13) + b$

$19 = 26 + b$

$-26 \quad -26$

$-7 = b$

$y = 2x - 7$

$f(x) =$ 2x-7

4. What is the slope of your line? $m =$ 2
Interpret its meaning. Does it make sense in the context of this situation? Please use complete sentences to respond to these questions.

The slope m=2 does make sense because if you look at the graph of the BEST-FITTING line, you'll see that the points on the line does go 2 points up and 1 point over if you keep in mind that the slope is RISE over RUN. (2 is actually $\frac{2}{1}$).

5. Find the value of $f(45)$ using your function from part 3. Show your work, then write your result in the blank below.

$f(45) = 2(45) - 7$

$= 90 - 7$

$= 83$

1980
+ 45
2025 years

$f(45) =$ 83 or 8.3 million people

Write a sentence interpreting the meaning of $f(45)$ in the context of this project.

f(45) in this problem is indicating that f(x)=f(45) which means I should plug in 45 as x and solve for y. If I solve for y, I can find out how big the population will be in 45 years from 1980, or 2025.

6. Use your function from part 3 to approximate in what year the residential population of Utah reached 2,000,000. Show your work.

$200 = 2x - 7$

$+7 \quad +7$

$\frac{207}{2} = \frac{2x}{2}$

$103.5 = x$

1980
+ 103.5
2083.5

2,000,000 people will be in Utah in the year 2083.5.

7. Compare your linear function with that of another student or group.

Comparison function: $f(x) =$ 2x-16

Is the comparison function the same as the function you wrote down for part 3?

The functions are different although the slope is the same.

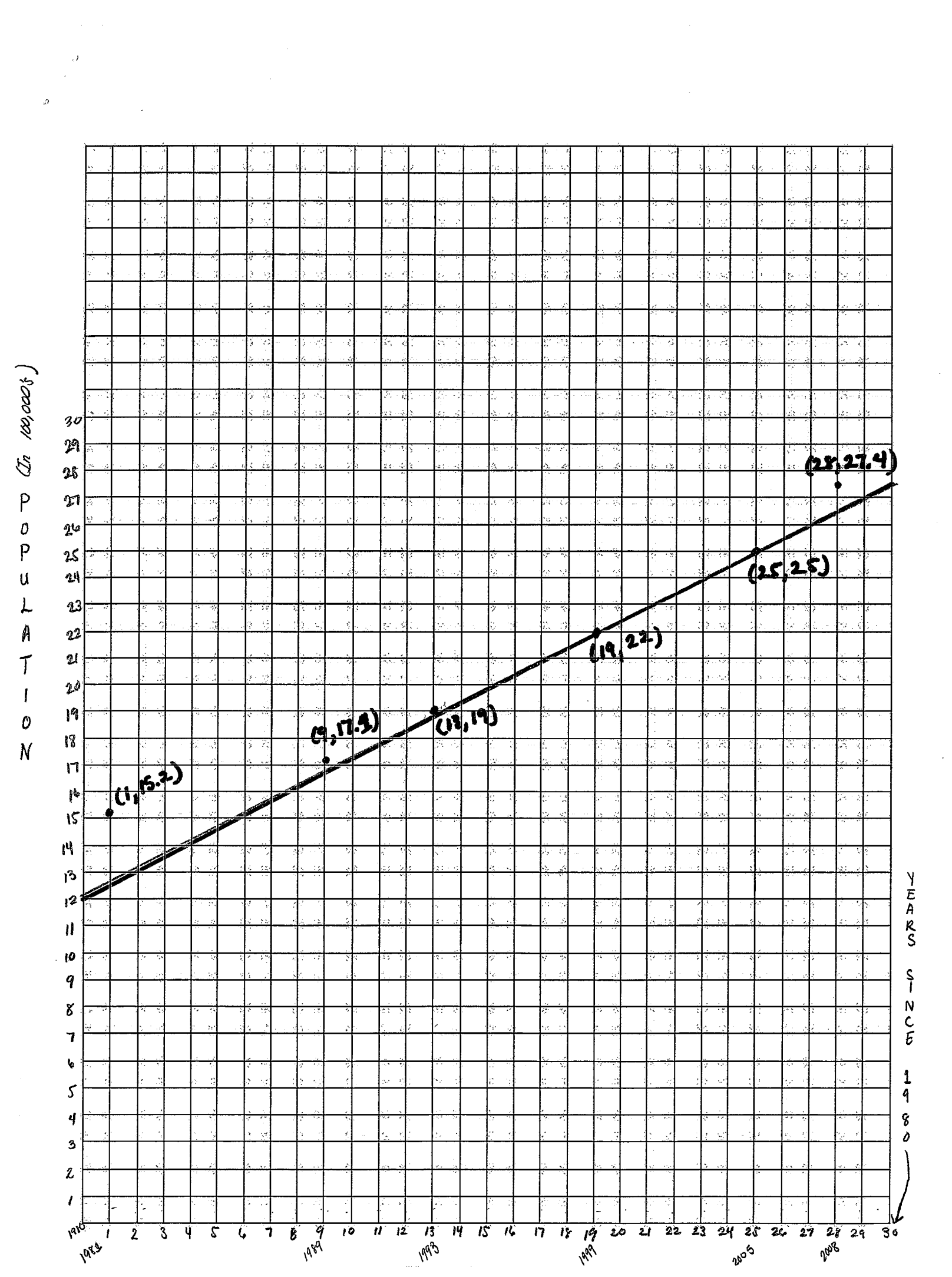
If they are different, explain why.

Even though the y-coordinate is different (variable b), we have the same slope. It's different because we used different coordinates to find (b).

If they are the same, explain why.

8. In actuality, using a linear growth model for population is not common. Most models are exponential models, due to the fact that most populations experience relative growth, i.e. 2% growth per year. Linear models for nonlinear relationships like population work only within a small time frame valid close to the time of the data modeled. Discuss some of the false conclusions you might reach if you use your linear model for times far from 1980-2008.

Some false conclusions that you can conclude from times 1980-2008 are ones where if you use linear equations then you aren't counting the people whose moved in, moved out, are born, have died, etc. There are too many factors to include to do a linear equation/graph since the different factors change all the time. For example, in 2005, many employees from YESCO were relocated from Las Vegas, NV to Logan, UT. That's a lot of people and isn't predicted in this equation. The growth in this equation is the average growth population, not the exact percent/number.


POPULATION (In 100,000's)
YEARS SINCE 1980
(1, 15.2)
(9, 17.3)
(13, 19)
(19, 22)
(25, 25)
(28, 27.4)
1980
1988
1989
1993
1999
2005
2008