

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

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

$(17, 21), (23, 24)$

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

$$\frac{23-17}{24-21} = \frac{6}{3} = \boxed{2} \text{ slope}$$

$$y - 21 = 2(x - 17)$$

$$y - 21 = 2x - 34$$

$$\boxed{y = 2x - 13}$$

$$f(x) = \underline{2x - 13}$$

4. What is the slope of your line? $m = \underline{2}$

Interpret its meaning. Does it make sense in the context of this situation? Please use complete sentences to respond to these questions.

Yes this slope makes sense for the majority of the data. The line is not perfect but more an approximation of the data so the slope seems to mirror the actual slope of the line.

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

$$f(45) = 2(45) - 13$$

$$90 - 13$$

$$f(45) = \boxed{77}$$

$$f(45) = \underline{77}$$

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

This means that 45 years after 1980 (year 2025) the population will have grown to 7,700,000.

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

$$2,000,000 \div 100,000 = 20 \quad \text{This means that roughly 16.5 years after 1980}$$

(year 1996 $\frac{1}{2}$) the population will have reached

$$2,000,000.$$

$$20 = 2x - 13$$

$$33 = 2x$$

$$\boxed{16.5} = x$$

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

Comparison function: $f(x) = 0.5x + 12.5$ by Brenda Polanco

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

The comparison function is not the same, however similar.

If they are different, explain why.

They are not the same because the data points used are approximations and could not get accurate readings from one person to another because there is an array of point choices instead of an exact line of points.

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.

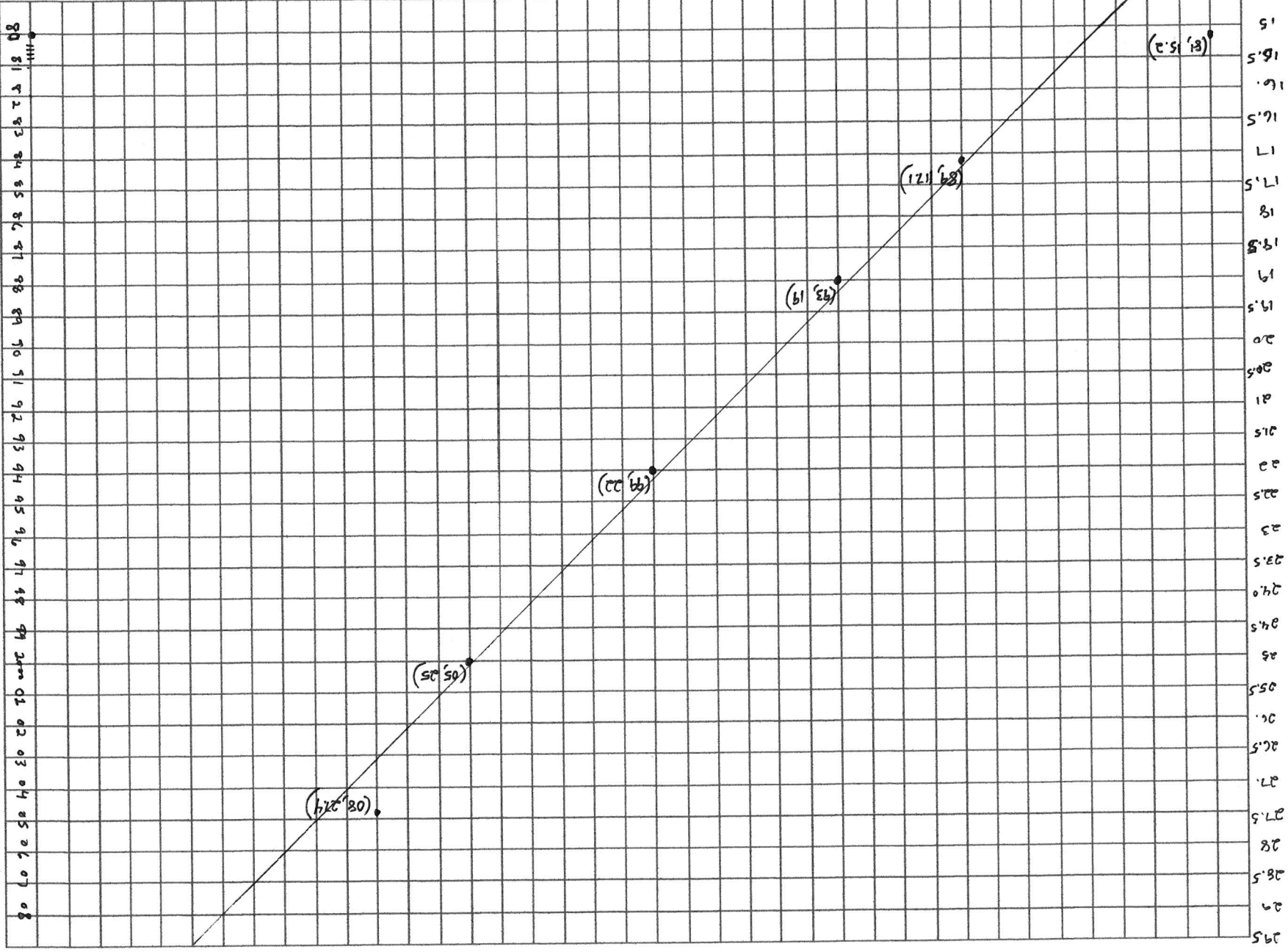
The farther you go in years the more exponential the growth would look. If we continued to use this inaccurate line we would be lead to believe the the population was larger than it actually would have been.

YEARS

Population

YEARS

Population in 100,000's



80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30

Years from 1980

15 15.5 16 16.5 17 17.5 18 18.5 19 19.5 20 20.5 21 21.5 22 22.5 23 23.5 24 24.5 25 25.5 26 26.5 27 27.5 28 28.5 29 29.5