Natalie Smith
Math 1010 Projects

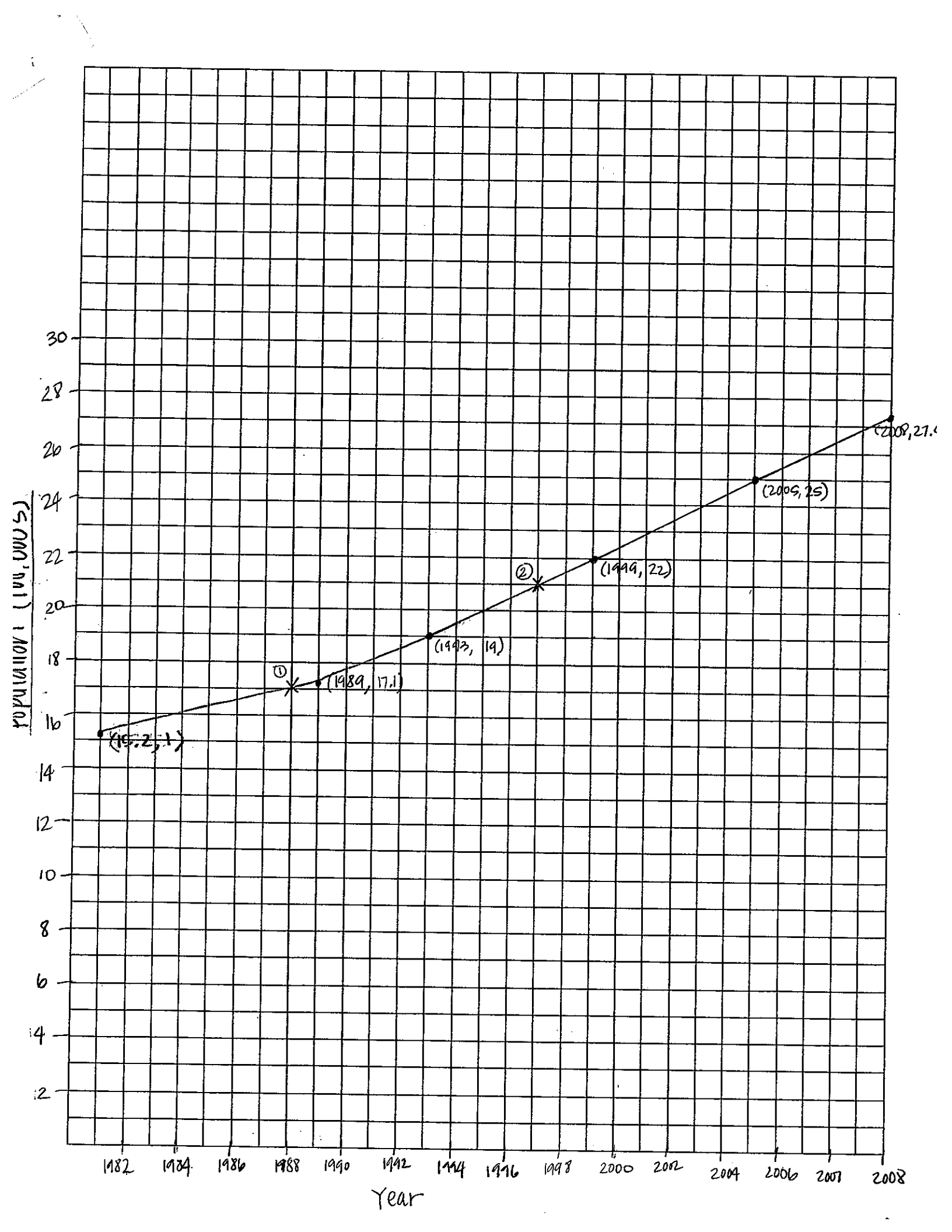
Modeling Utah Population Data

1) See graph.
2) See graph.
3) Point #1: (8, 17)
   Point #2: (17, 21) > see graph

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{21 - 17}{17 - 8} = \frac{4}{9}$$

$$f(x) = mx + b$$
$$f(x) = \frac{4}{9}x + 21$$

4) Slope (m) = 4/9
   a. This slope does make sense in the context of the situation because if you follow point #1 up four and over nine (following the rise over run principle), it follows the pattern of the line and takes you exactly to point #2.
5) $f(45) = \frac{4}{9}x + 21$
   $= \frac{4}{9}(45) + 21$
   $f(45) = 20 = (20, 45)$
   a. I think by finding f(45), it is saying that in the year 2025 the population would be 2,000,000. Based on the graph and the statistics we've been given, I do not think this is accurate. I would estimate the population to be over 4,000,000 in 2025.
6) $f(20) = \frac{4}{9}x + 21$
   $= \frac{4}{9}(20) + 21$
   $= \frac{184}{9} + 21 \approx 41.4 \quad (20, 41.4)$
   a. Based on the graph, the population would have been 2 million in 1995. The function shown does not represent the same date, even close to. I think the graph is much more accurate than my estimated function for determining this information.
7) Did not compare with anyone.
8) False conclusions: You might estimate a much lower population in years earlier than 1980 and much higher growth after 2008. It may not be realistic or accurate to say that the population would almost double in the next 28 years as it did in the first 28 years of this study. It could by either much higher or much lower, but likely it will not be the same.
9) I've never thought to analyze statistics in terms of (x,y). It makes sense to set up a graph like this one and find patterns with the data, as well as estimate what might happen in the future. As mentioned in question 8, linear graphs may not be the best way to analyze population, but I think researching and analyzing any set of data with some type of graph would be very useful in the "real world".


Population (thousands)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2007
2008
Year
(1989, 17.1)
(1993, 19)
(1999, 22)
(2006, 25)
(2008, 27.
①
②

After Ch. 2

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 graph paper, plot the data given in the table as ordered pairs.

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. Use these points to find a linear function $f(x)$ for the line.

4. What is the slope of your line? Interpret its meaning. Does it make sense in the context of this situation?

5. Find the value of f(45). Write a sentence interpreting its meaning in context.

6. Use your function to approximate in what year the residential population of Utah reached 2,000,000.

7. Compare your linear function with that of another student or group. Are they different? If so, 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.

9. Reflective Writing. Did this project change the way you think about how math can be applied to the real world? Write one paragraph stating what ideas changed and why. If this project did not change the way you think, write how this project gave further evidence to support your existing opinion about applying math. Be specific.