FINAL 10

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MATH 1010
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MODELING UTAH POPULATION DATA

Math 1010 Intermediate Algebra 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.

(9) (25)
(1989, 17.0), (2005, 25.0)

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

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{25.0 - 17.0}{2005 - 1989} = \frac{8}{16} = \frac{1}{2}$ $m = \frac{1}{2}$ ✓

$y - y_1 = m(x - x_1)$ $y - 25 = \frac{1}{2}(x - 25)$ $y = \frac{1}{2}x + 12.5$

$y - 17 = \frac{1}{2}(x - 9)$

ChK $y = \frac{1}{2}x + 12.5$ ✓

$f(x) = \frac{1}{2}x + 12.5$

4. What is the slope of your line? $m = \frac{1}{2}$
Interpret its meaning. Does it make sense in the context of this situation? Please use complete sentences to respond to these questions.

THE SLOPE VALUE MAKES SENSE IF MY INTERPRETATION OF IT IS CORRECT. IT TELLS ME THAT IN 16 YEARS TIME THE UTAH POPULATION GREW BY 50,000 PEOPLE PER YEAR (800,000 POP. GROWTH BETWEEN 1989 – 2005)
THE "b" VALUE DOESN'T MAKE SENSE TO ME THOUGH (12.5).
IT IMPLIES THE UTAH POPULATION WILL INCREASE

EVERY TWO YEARS. (?)

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

$f(45) = \frac{1}{2}(45) + 12.5 = \frac{45}{2} + 12.5 = 22.5 + 12.5$

$f(45) = 35.0$

$f(45) =$ 35

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

I INTERPRET $f(45)$ TO RELATE TO TIME. SPECIFICALLY, THE NUMBER OF YEARS BEYOND 1980. SO $f(45) = 35.0$ INDICATES THAT IN 2025 UTAH'S ESTIMATED POPULATION WILL BE 3.5 MILLION PEOPLE.

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 = 20 ON Y axis of graph

$f(x) = \frac{1}{2}x + 12.5$

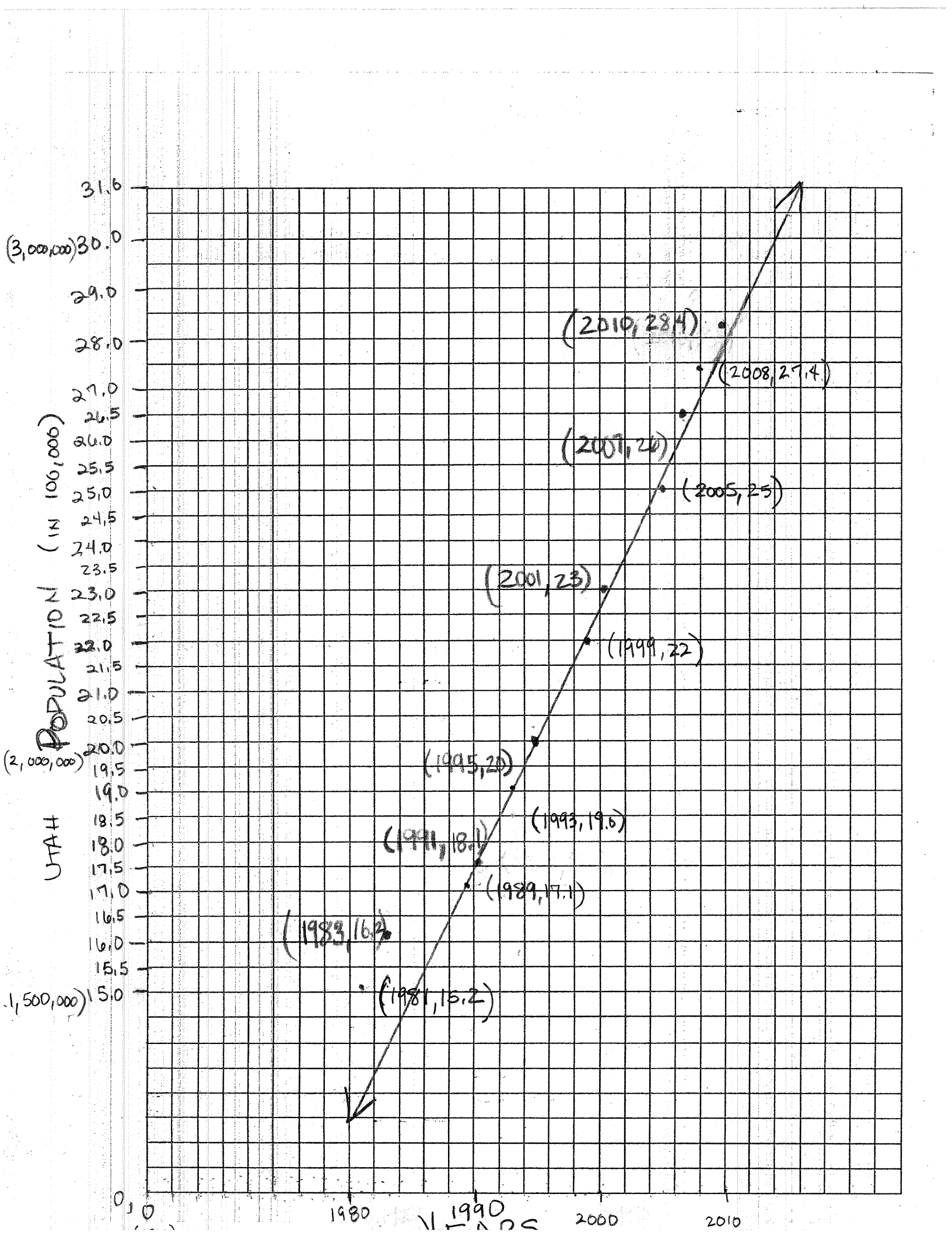
$20 = \frac{1}{2}x + 12.5$, $2(20) = \left(\frac{1}{2}x + 12.5\right)2$, $40 = x + 25$,

$-x = 25 - 40$, $-x = -15$, $-1(-x) = (-15)-1$, $x = 15$

$1980 + 15 = 1995$ IN 1995 Utah's population reach 2,000,000.

7. In actuality, a linear growth model is only one of several types of graphical models that are used. Also, certain models will be more accurate than others for a specific situation. What are some of the false conclusions you might reach by using this linear model about population for times far from 1980-2008?

Population growth is directly affected by many socio-economic factors. In short, population growth is far from being linear. Thus, the margin for error increases exponentially as the "x" value increases (number of years beyond 1980).


UTAH POPULATION (IN 100,000)
31.6
(3,000,000) 30.0
29.0
28.0
27.0
26.5
26.0
25.5
25.0
24.5
24.0
23.5
23.0
22.5
22.0
21.5
21.0
20.5
(2,000,000) 20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
(1,500,000) 15.0
0
0
1980
1990
2000
2010
YEARS
(2010, 28.4)
(2008, 27.4)
(2007, 26)
(2005, 25)
(2001, 23)
(1999, 22)
(1995, 20)
(1993, 19.6)
(1991, 18.1)
(1989, 17.1)
(1983, 16.2)
(1981, 15.2)

8. Reflective Writing: This project is designed to show you an example of how math can be applied to the real world. Write one paragraph stating how mathematical concepts from this course were applied to this project. Be specific.

IT WAS INTERESTING APPLYING A LINEAR FUNCTION TO A REAL WORLD SCENARIO THAT IS ANYTHING BUT LINEAR. THOUGH THIS EXAMPLE DIDN'T BEST FIT THE ALGEBRAIC CONCEPT IT ALLOWED ME TO UTILIZE THE MATHMATICAL TOOLS I'VE LEARNED SO FAR. IT'S AMAZING TO THINK THAT THESE TOOLS CAN BE USED TO QUANTIFY CHANGES IN A GIVEN DATA SET AND GIVES ME THE ABILITY TO GAUGE PROBABILITIES & POTENTIAL TRENDS.