

Assignment 2.3

Form G

Polynomial Models in the Real World

Find a polynomial function whose graph passes through each set of points.

1. $(4, -1)$ and $(-3, 13)$
2. $(1, -\frac{9}{2})$ and $(6, -2)$
3. $(7, -5)$ and $(-1, 3)$
4. $(0, -3)$, $(-2, -7)$, and $(2, 9)$
5. $(-3, 15)$, $(1, 11)$, and $(0, 6)$
6. $(-2, -12)$, $(1, -6)$, and $(2, -24)$
7. $(4, -1)$, $(-2, -13)$, and $(1, 2)$
8. $(0, 9)$, $(2, 21)$, $(-1, 0)$, and $(3, 36)$

Find a polynomial function that best models each set of values.

9. Let x = the number of years after 1985.
10. Let x = the number of years after 1970.

World Gold

Year	Production (millions of troy ounces)
1985	49.3
1990	70.2
1995	71.8
2000	82.6

SOURCES: *The World Almanac* and *World Gold*

Life Expectancy

Year of Birth	Female (years)
1970	74.7
1980	77.4
1990	78.8
2000	79.7

SOURCE: U.S. Bureau of the Census

11. Let x = the number of years after 1985.
12. Let x = the number of years after 1980.

U.S. Energy

Year	Total Production ($\times 10^{15}$ Btu)
1985	64.9
1990	70.8
1995	71.0

SOURCE: Energy Information Administration

Social Security Benefits

Year	Monthly Average (dollars)
1980	321.10
1990	550.50
2000	844.60

SOURCE: www.infoplease.com

Find a cubic and a quartic model for each set of values. Then determine which model best represents the values.

13.

x	-2	-1	0	1	2
y	-7	-3	3	5	-3

14.

x	-2	-1	0	1	2
y	2	-6	2	8	42

Practice (continued)

Form G

Polynomial Models in the Real World

Use your models from Exercises 9–12 to make predictions.

15. Estimate world gold production for 2010, 2020, and 2025.
16. Estimate the life expectancy for women born in 1986, 1992, and 2005.
17. Estimate the U.S. energy production for 2002, 2005, and 2010.
18. Estimate the average monthly Social Security benefits for 1970, 1996, and 1999.
19. Find a cubic function to model the data below. (*Hint:* Use x to represent the gestation period.) Then use the function to estimate the longevity of an animal with a gestation period of 151 days.

Gestation and Longevity of Certain Animals

Animal	Rat	Squirrel	Pig	Cow	Elephant
Gestation (in days)	21	44	115	280	624
Longevity (in years)	3	9	10	12	40

SOURCE: www.infoplease.com

20. **Error Analysis** Your teacher gives the class the table at the right and asks you to find a polynomial model for the data set. Then he asks the class to estimate the percent of U.S. foreign-born population in 1920. Your friend uses $x = -10$ and estimates the percent as 16.1. What did your friend do wrong? What is the correct estimate?

U.S. Population

Year	Foreign-Born (percent)
1910	14.7
1930	11.6
1950	6.9
1970	4.7
1990	8.0
2000	10.4
2004	11.7

SOURCE: Bureau of the Census

21. **Reasoning** Using the data set from Exercise 12 and the model you determined, find the average monthly Social Security benefits for the year 2050. Do you have much confidence in this prediction? Explain.
22. Find a cubic model for the following set of values: $(0, -4)$, $(-1, -6)$, $(5, -264)$, and $(2, -18)$. Using the regression coefficient, determine whether the model is a good fit.