



Name _____ Date _____ Period _____

MODELING WITH POLYNOMIAL FUNCTIONS WORKSHEET

You will need a Graphing Calculator to help you with some of these questions.

1. The cost (in dollars) of manufacturing x items is given by: $C(x) = x^3 - 8x^2 + 16x$. What is the cost of manufacturing 18 items?
2. Suppose that the population of a certain city during a certain time period can be approximated by: $P(x) = -0.1x^5 + 2.5x^4 + 6000$, where x is time in years since 1960. Find the population of the city in 1982.
3. The concentration of a drug in the bloodstream in mg/dl “ x ” hours after consumption is given by the function $C(x) = 0.003x^3 - 0.093x^2 + 0.504x$. What is the blood concentration level of the drug after 4 hours?
4. A rectangular box has a length that is two inches less than its width and a height that is three inches less than the width. Find the dimensions of the box if the volume of the box is 30 in^3 .
5. A rectangular box has a length that is four inches less than its width and a height that is six inches more than the width. Find the approximate dimensions of the box if the volume of the box is 48 in^3 . Round your answer to the nearest hundredth of an inch.

6. The rate of lung cancer cases per 100,000 females in the year t (where $t = 0$ corresponds to 1930) can be modeled by $C(t) = 0.00028t^3 - 0.011t^2 + 0.23t + 0.93$. Find the expected number of lung cancer cases in 1980 and in 2006.

7. Find the formula for the volume of a cylinder that has a height that is 4 cm longer than the radius.

$$(V = \pi r^2 h)$$

8. The polynomial $f(x) = \frac{\pi}{3}x^3 - 5\pi x^2 + \frac{500\pi d}{3}$ can be used to find the depth that a ball having a diameter of 10 cm sinks in water. The constant d represents the density of the ball, where we assume the density of water is 1. The smallest positive zero of $f(x)$ is the depth that the ball sinks. Use your grapher to approximate the depth a solid aluminum ball having $d = 2.7$ will sink.

9. A survey team measures the concentration (in parts per million) of a particular toxin in a local river. On a normal day, the concentration of the toxin at time x hours after the factory upstream dumps its waste is given by the function $T(x) = -0.006x^4 + 0.23x^3 - 0.07x^2 + 0.03x$, where $0 \leq x \leq 24$. Use your grapher to determine the time at which the concentration is the greatest.

10. The polynomial $G(x) = -0.006x^4 + 0.140x^3 - 0.53x^2 + 1.79x$ measures the concentration of a dye in the bloodstream x seconds after it is injected. Use your grapher to answer the following questions.

a) After how many seconds does the concentration reach its peak?

b) How long does it take for the dye to completely leave the bloodstream?

11. The polynomial function $L(p) = p^3 - 5p^2 + 20$ gives the rate of gas leakage from a tank as pressure increases in p units from its initial setting. ($p = 0$ represents the “initial setting”.) What value of p will result in the lowest rate of gas leakage? Use your grapher!

12. As the number of farms has decreased in the United States, the average size of the remaining farms has grown larger as shown in the table.

a) Use a graphing calculator to fit quadratic, cubic and quartic functions to the data. Let x represent the number of years since 1900. Using the R^2 value, determine which function is the best fit.

b) Using the function that best fits the model, estimate the average acreage in 1955, 1998 and in 2011.

YEAR	AVG ACREAGE PER FARM
1900	147
1910	139
1920	149
1930	157
1940	174
1950	213
1960	297
1970	374
1980	426
1990	460
1995	438
2000	436
2003	441
2005	445
2009	418

13. The table shows the number of unemployed in the United States from 1996 through 2006.

a) Use a graphing calculator to fit cubic and quartic functions to the data. Let x represent the number of years since 1996 (0, 1, 2, ...) Using the R^2 values, determine which function is the best fit.

YEAR	# of UNEMPLOYED (in thousands)
1996	397
1997	350
1998	340
1999	275
2000	269
2002	360
2003	457
2004	460
2005	435
2006	411

b) Use the best fitting model found in part (a) to estimate the number of unemployed in 2001.