

DIRECTIONS Give complete solutions to the following problems be sure to provide all the necessary steps to support your answers.

1. The table shows the numbers N (in millions) of television sets in U.S. households from 2000 through 2006.

Year	Television sets, N
2000	245
2001	248
2002	254
2003	260
2004	268
2005	287
2006	301

a. Ans _____

b. Ans _____

c. Ans _____

a. Use the regression feature of a graphing utility to find the equation of the least squares regression line that fits the data. Let $t = 0$ represent 2000. (Round the slope and y-intercept to two decimal places.)

b. Use the graphing utility to create a scatter plot of the data. Then graph the model you found in part (a) and the scatter plot in the same viewing window. How closely does the model represent the data?

i. The model is a good fit to the actual data.

ii. The model is not a good fit to the actual data.

c. Use the model to estimate the number of television sets in U.S. households in 2007. (Round your answer to one decimal place.)

2. Determine whether the variation model is of the form $y = kx$ or $y = k/x$.

x	5	10	15	20	25
y	2	4	6	8	10

a. i. $y = kx$

ii. $y = k/x$

2a. Ans _____

b. Find k .

2b. Ans _____

c. Write a model that relates y and x .

2c. Ans _____

3. The simple interest on an investment is directly proportional to the amount of the investment. By investing \$2250 in a certain bond issue, you obtained an interest payment of \$101.25 after 1 year. Find a mathematical model that gives the interest I for this bond issue after 1 year in terms of the amount invested P .

3. Ans _____

4. The rate of change R of the temperature, in degree Fahrenheit per minute (F^0/min) of an object is proportional to the difference between the temperature T of the object and the temperature T_e of the environment in which the object is placed. Suppose the object, initially has temperature $150F^0$ is placed in a room at a temperature of $85F^0$.

- a. Find a mathematical model for the verbal statement with k as the constant of proportionality 4a. Ans _____

- b. Find k if the temperature reaches $140 F^0$ two minutes later. 4b. Ans _____

- c. Find the temperature of the object if the rate R at which the temperature changing is $-3.00 F^0/\text{min}$ 4c. Ans _____

4. The rate of growth R of a population is jointly proportional to the size S of the population and the difference between S and the maximum population size L that the environment can support. Suppose the size of the population initially 275 millions and the maximum population size the environment can support is 400 millions. (Use k for the constant of proportionality.)

- a. Find a mathematical model for the verbal statement.

5a. Ans _____

- b. Find the size of the population if the rate at which the population changing is 480 and the constant of proportionality is 0.03. 5b. Ans _____

6. Use the fact that the diameter of the largest particle that can be moved by a stream varies approximately directly as the square of the velocity of the stream. A stream with a velocity of $1/4$ mile per hour can move coarse sand particles about 0.02 inch in diameter. Approximate the velocity required to carry particles 0.16 inch in diameter. (Round your answer to two decimal places.)

6. Ans _____