Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Advanced Functions and Modeling Unit 11 Homework 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hours Spent Studying** | **Math SAT****Score** | **Predicted****Math SAT****Score** | **Residual** |
| 4 | 390 |  |  |
| 9 | 580 |  |  |
| 10 | 650 |  |  |
| 14 | 730 |  |  |
| 4 | 410 |  |  |
| 7 | 530 |  |  |
| 12 | 600 |  |  |
| 22 | 790 |  |  |
| 1 | 350 |  |  |
| 3 | 400 |  |  |
| 8 | 590 |  |  |
| 11 | 640 |  |  |
| 5 | 450 |  |  |
| 6 | 520 |  |  |
| 10 | 690 |  |  |
| 11 | 690 |  |  |
| 16 | 770 |  |  |
| 13 | 700 |  |  |
| 13 | 730 |  |  |
| 10 | 640 |  |  |

 1. Find the linear regression for the data. Round to the nearest thousandth.

 $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2. State the correlation coefficient and the coefficient of determination.

 $r= $\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3. Interpolate: What is the predicted score of a person who studied for 15 hours?

 4. Extrapolate: What is the predicted score of a person who studied for 30 hours?

 5. How long should a person study if they want to score a 710?

 6. Use your model to find the predicted score for each actual score. Fill in the column in the chart labeled *Predicted Math SAT Score*.

 7. Calculate the residual at each point (*actual – predicted*).

 8. Construct a residual plot below. What does the plot tell you about the data?



Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Advanced Functions and Modeling Homework 2**

**The table below shows the amount of waste generated per year by people in the United States (Source: US EPA, 2012)**

|  |  |
| --- | --- |
| **Year** | **Amount of Waste** **(in tons)** |
|  1960 | 88.1 |
| 1965 | 104.4 |
| 1970 | 121.1 |
| 1975 | 127.8 |
| 1980 | 151.6 |
| 1985 | 166.3 |
| 1990 | 208.3 |
| 1995 | 217.3 |
| 2000 | 243.5 |
| 2005 | 253.7 |
| 2010 | 250.4 |
| 2012 | 250.9 |

 1. Find the linear, exponential, and quadratic models. State the coefficient of determination for each. Let $x=0$ represent 1960.

 Linear $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_

 Quadratic $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_

 Exponential $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_

 2. Which model is the best fit? Explain your answer.

 3. With each function found in #1, predict the amount of waste in 2000 and 2005. How does this compare to the actual data? Does this support your answer in #2?

**In the years before the Civil War, the population of the United States grew rapidly, as shown in the following table from the U.S. Bureau of the Census.**

|  |  |
| --- | --- |
| **Year** | **Population****(in millions)** |
| 1790 | 3.93 |
| 1800 | 5.31 |
| 1810 | 7.24 |
| 1820 | 9.64 |
| 1830 | 12.86 |
| 1840 | 17.07 |
| 1850 | 23.19 |

 4. Find the exponential and quadratic models. State the coefficient of determination for each. Let $x=0$ reprsent 1790.

 Quadratic $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_

 Exponential $y=$ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $R^{2}=$ \_\_\_\_\_\_\_

 5. Use both models to predict the population in 1810. Which model is closest to the actual population?

 6. Use both models to predict the population in 1850. Which model is closest to the actual population?