

2.6 Competing Function Model Validation

AP Precalculus

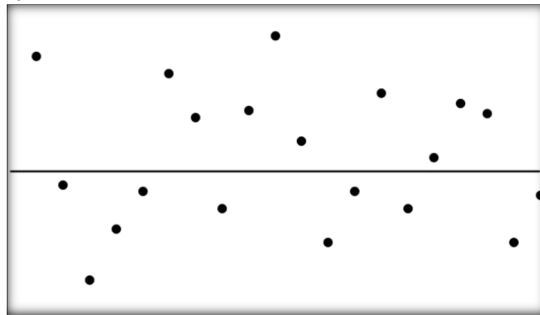
Name: _____

CA #2

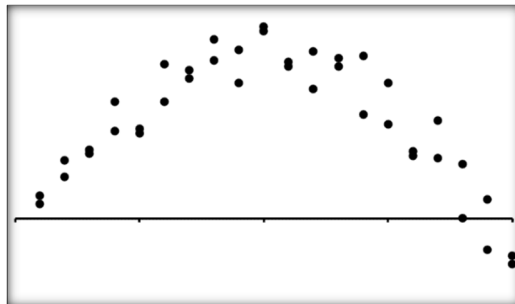
1. The table below gives the U.S. national debt (in billions of U.S. dollars) at various years. Let $t = 0$ represent the year 1900.

Year t (input)	49	70	80	90	105	122
U.S. Debt (in billions) D (output)	\$253	\$371	\$908	\$3,233	\$7,933	\$30,928

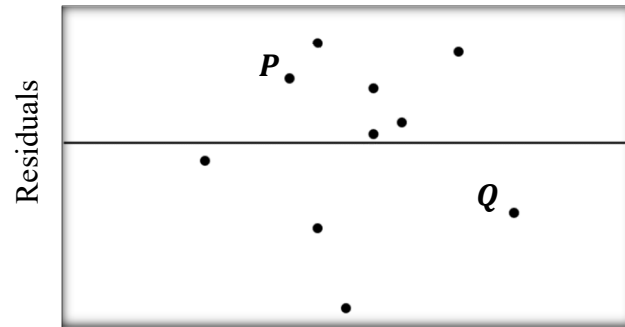
- a. Find an exponential regression curve. Round to three decimal places.
- b. Use your model from part *a* to find the error in the year 2005.
- c. Is the value predicted an overestimate or underestimate of the actual value?
2. A student creates a model for a data set. The residual plot for their exponential regression is shown. Is the model appropriate? Why or why not?



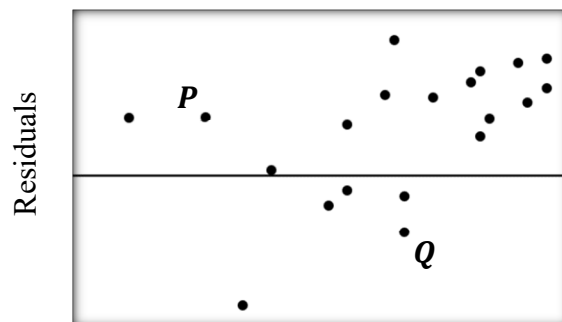
3. A student creates a model for a data set. The residual plot for their quadratic regression is shown. Is the model appropriate? Why or why not?



4. The height of fathers is being compared to the height of their adult sons. A regression model was calculated with the father's height (in inches) as input values and the son's height (in inches) as the output values. The residual plot for the regression model and data points is below.



- a. The given residual plot has a point labeled P at the coordinate $(68, 2.784)$. What does point P indicate in the context?
- b. The point labeled Q is at the coordinate $(76, -3.01)$. What does point Q indicate in the context?
5. For students who are taking both AP Statistics and AP Precalculus, their grades (as a percentage) are collected and compared. A regression model was calculated with the AP Statistics grade as input values and AP Precalculus grade as the output values. The residual plot for the regression model and data points is below.



- a. The given residual plot has a point labeled P at the coordinate $(97, 12.04)$. What does point P indicate in the context?
- b. The point labeled Q is at the coordinate $(82, -7.85)$. What does point Q indicate in the context?

Answers to 2.6 CA #2

1a. $D(t) = 4.718(1.073)^t$	1b. $7704.221 - 7933 = -228.779$	1c. underestimate
2. Yes, no clear pattern.		3. No, the residual plot creates a pattern
4a. Because point P is above the x -axis, for the father with a height of 68 inches, the model underestimates the son's height by 2.784 inches.	4b. Because point Q is below the x -axis, for the father with a height of 76 inches, the model overestimates the son's height by 3.01 inches.	
5a. Because point P is above the x -axis, for the student with an AP Statistics grade of 97%, the model underestimates the AP Precalculus grade 12.04%.	5b. Because point Q is below the x -axis, for the student with an AP Statistics grade of 82%, the model overestimates the AP Precalculus grade 7.85%.	