Name: Key Date: _____

## Line of Best Fit – Linear and Exponential

1. Students in Ms. Garth's Algebra II class wanted to see if there are correlations between test scores and time spent watching television. The students created a table in which they recorded 13 student's average number of hours per week spent watching television and scores on a test. Use the actual data collected by the students in Ms. Garth's class, as shown in the table below, to answer the following questions.

| TV hrs/week (average) | 30 | 12 | 30 | 20 | 10 | 20 | 15 | 12 | 15 | 11 | 16 | 20 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Scores | 60 | 80 | 65 | 85 | 100 | 78 | 75 | 95 | 75 | 90 | 90 | 80 | 75 |

a) Find the best fitting linear model that represents the data and the correlations coefficient. $f(x) = -1.43x + 105.98$ $r = -0.82$

b) Identify the y-intercept. What does it represent in the context of the problem?
y-int = (0, 105.98) This represents the anticipated score of someone who watches no television.

c) Using this model, what is the estimated test score of a student who watches TV for 35 hours? $f(35) = 55.80\%$ or $55.93\%$

d) Using this model, what is the highest number of hours a student can watch TV and still pass the test (make a 70)? $70 = -1.43x + 105.98$
$-105.98 \quad -105.98$
$-35.98 = -1.43x$
$x = 25.16$

2. The town planners designed a town for an optimal growth of 8% per year. Below is a table representing the growth (in thousands) from 1997 to 2003.

| Year | Population |
|---|---|
| 1997 ← 0 | 50 |
| 1998 | 54 |
| 1999 | 58 |
| 2000 | 63 |
| 2001 | 68 |
| 2002 | 73.5 |
| 2003 | 79.3 |

a) Find the best fitting exponential model that represents the data and the correlation coefficient. $f(x) = 49.94(1.08)^x$ $r = .99992$

b) Using this model, what is the predicted population in the year 2017?
$f(20) = 233.48$ or $232.77$

c) Using this model, what was the estimated population in 1977?
$f(-20) = 10.68$ or $10.71$

d) In what year will the population have doubled?
2006 (In the table, 100 is between 19 and 20 years after 1997)

3. A rapidly growing bacterium has been discovered. The data in the following chart represents the number of bacteria in a sample each hour.

| Hours | Bacteria Present |
|---|---|
| 0 | 20 |
| 1 | 40 |
| 2 | 75 |
| 3 | 150 |
| 4 | 297 |
| 5 | 510 |

a) Write the linear model that represents the data and the correlation coefficient.

$f(x) = 94.17x - 53.43$ $r = .93$

b) Write the exponential model that represents the data and the correlation coefficient.

$f(x) = 20.51(1.92)^x$ $r = .9995$

c) Which model is the best fitting model? Explain.

The exponential is better fitting. Its correlation is closer to 1.

d) Using the best fitting model, how much bacteria is present after 10 hours?

$f(10) = 14,245.92$ or $13,962.97$

e) Using the best fitting model, how much bacteria is present after one day?

$f(24) = 135,520,033.1$ or $129,179,961$

4. Jerry, a barista at Starbucks, recorded his sales when he's on the clock. Each week, Jerry calculated the total revenue for all of his sales. The graph is a scatter plot from the given data.

a. Determine if the correlation is positive, negative, or none.

Positive

b. Estimate the correlation coefficient.

About 0.5

c. Is there causation? Why or why not?

Probably not. The correlation is weak and weeks don't seem to have a direct connection to sales.