Regression Analysis Name_____**ANSWERS**_____

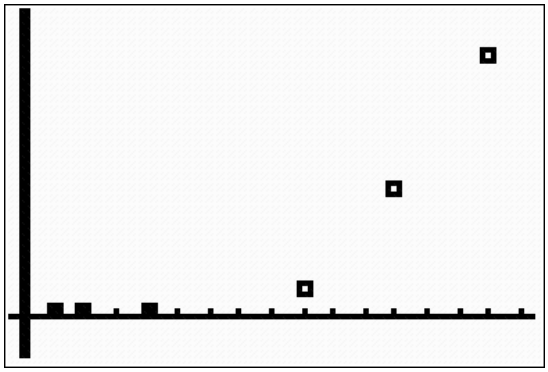
Deciding Upon a Model

The ever increasing power of microprocessors has been a driving force in the computer revolution since 1971. Hardware designers have been able to increase integrated circuit complexity by placing more and more transistors on each computer chip.

Year	Transistors per Chip
1971	2,300
1972	3,500
1974	4,500
1979	29,000
1982	134,000
1985	275,000
1989	1,180,000
1993	3,100,000
1997	7,500,000
1999	22,000,000
2000	42,000,000
2003	220,000,000
2004	592,000,000
2007	789,000,000
2008	1,900,000,000
2010	2,300,000,000

Mathematically speaking, how did this rapid growth progress, and if it continues, what predictions can be made about further growth?

1. Set the year 1970 equal to 0 (so 1971 → 1, 1982 → 12, etc.), and input the first **six** years in L_1. Then input the transistors per chip in terms of "thousands" (2,300 → 2.3, etc.) for the **first 6 entries ONLY** in L_2. Display the scatter plot of these six points.



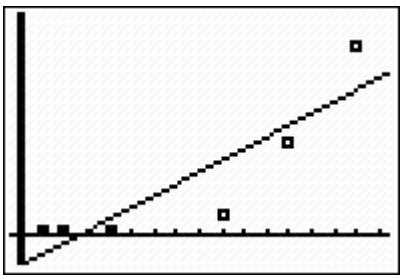
2. Based upon the shape of the plot, which regression model, or models, do you think will best fit this data? Exponential or Power

3. Gathering more information will result in the best choice of a model. Examine each linear based model to determine its visual fit to the data, the correlation coefficient and the regression equation. Also, determine the models predictability value for the year 2000. Record your findings and sketch the "fit" in the space provided. Round values to 3 decimal places when needed.

Linear Model:

Y1 = _17.248x – 48.891_____

r = __0.891_____

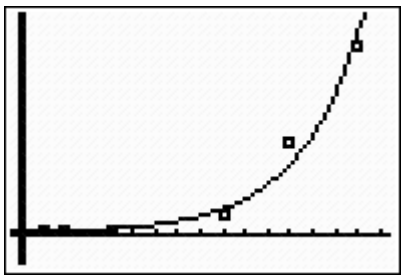


Value at x = 2000: _468.537 (468,537)

Exponential Model:

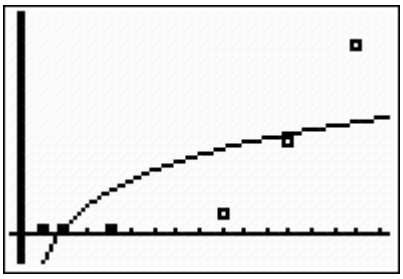
Y1 = __1.466 (1.423^x) _____

r = __0.994_____



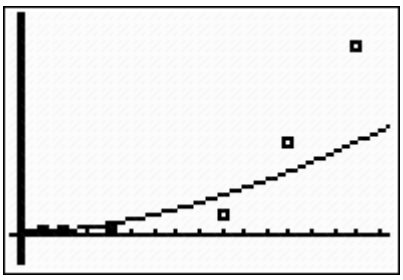
Value at x = 2000: 58164.845 (58,164,845)

Logrithmic Model:
Y1 = _-45.856 + 76.395 ln(*x*) _____
r = __0.745_____



Value at *x* = 2000: _213.979 (213,979)__

Power Model:
Y1 = _1.155 $x^{1.754}$ _____
r = _0.932_____



Value at *x* = 2000: _449.748 (449,748)_

4. Based upon the visual fit, the correlation coefficients, and the predictability, which regression model do you feel is the best fit? ___Exponential_____
Explain your choice: Visually, the linear model and the logarithmic model do not fit the data and their predictability is low. While the exponential and the power models both have high correlation coefficients, the power model's predictability is too low. The exponential is the best fit for this data, with the best predictability.

5. The transistor count discussed in this problem is said to double approximately every two years. Can this rate of increase continue indefinitely? ___No_____ Explain your answer.

Unfortunately, this trend is expected to continue until 2020, at which time the physical limits of atomic structure or power density could be reached, meaning no further growth. Designers are already predicting this future limitation and are researching the creation of an alternative system.