Name: _____ Date: _____

Exponential Regression Homework

1) **Baseball Salaries.** Ball players have been signing ever-larger contracts. The highest salaries (in millions of dollars per season) for some notable players are given in the following table.

Player	Year	Salary (millions $)
Nolan Ryan	1980	1.0
George Foster	1982	2.04
Kirby Puckett	1990	3.0
Jose Canseco	1990	4.7
Roger Clemens	1991	5.3
Ken Griffey, Jr.	1996	8.5
Albert Belle	1997	11.0
Pedro Martinez	1998	12.5
Mike Piazza	1999	12.5
Mo Vaughn	1999	13.3
Kevin Brown	1999	15.0
Carlos Delgado	2001	17.0
Alex Rodriguez	2001	25.2

a) Find an exponential model for this data. Use years since 1980 for the x variable.

$y = 2.97(1.14)^x$

b) What is the growth rate of salaries? State the growth rate in the context of the problem?

14% → .14

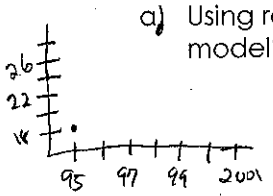
c) Predict a salary for the year 2012.

$y = 2.97(1.14)^{112} = 7016165$

d) Using the Internet, see if you can find out the largest baseball salary this year? How does it compare to your prediction?

2) **Internet Users.** Reliable data about Internet use are hard to come by. But Nau Internet Surveys cites estimates of 18 million Internet users in the U.S. in 1995, 76 million users in 1998, and 119.2 million in 1999.

a) Using regression, determine whether a linear or an exponential function would be a better model? Explain. Write down both equations, rounding to 3 decimals.



$y = 23.9x - 2257.4$

$y = 4.86(1.61)^x$

b) What is the slope from the best-fit linear function? Interpret this in the context of the problem.

Slope = 23.9, increases by 23.9 million every year

c) What was the annual growth factor and growth rate from the best-fit exponential function? Interpret the rate in the context of the problem.

61% → increases by a rate of 61% per year

d) Using the model that you felt was the best in part a, how many users do you predict for 2020?

Linear = exPo =

3) **Coins.** A box containing 1,000 coins is shaken and the coins are emptied onto a table. Only the coins that land heads up are returned to the box, and then the process is repeated. The accompanying table shows the number of trials and the number of coins returned to the box after each trial.

Trial	0	1	3	4	6
Coins Returned	1000	610	220	132	45

a) Write an exponential regression equation, rounding the calculated values to the nearest ten-thousandth.

$y = 1018.3(.59)^x$

b) Use the equation to predict how many coins would be returned to the box after the eighth trial.

$y = 1018.3(.59)^8$

$y \approx 15$ coins

AC CCGPS Alg/Geo
Unit 4: Describing Data
Class notes on **RESIDUALS**

Name: Key

My notes from power point:
Residuals find error of line of best fit

Main idea of residuals:

Steps
1) collect data
2) enter data into calc & find line of best fit
3) use line of best fit to find predicted values (plug X into line of best fit equation)
4) Calculate residuals (Actual − predicted)
5) graph (X, residual)

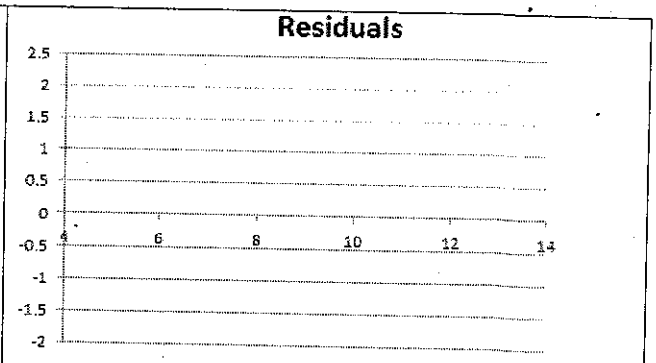
Example: Shoe

(1)

Height in inches	~~Hand~~ size in inches (from tip of middle finger to wrist)
66	8
66	7.5
68	8
62	8.5
64	8
62	6.5
65	8.5

(2) Line of best fit: $y = .08x + 2.99$

Height in inches	Predicted length of hand (use the line of best fit)	Residual (actual-predicted)
66	8.27	-.27
66	8.27	-.77
68	8.43	-.43
62	7.95	.55
64	8.11	-.11
62	7.95	-1.45
65	8.19	.31



* when you graph (X, residual) & it makes a pattern then the line of best fit is NOT truly the line of best fit

* when you graph (X, residual) & no pattern is made then the line of best fit is truly the line of best fit.

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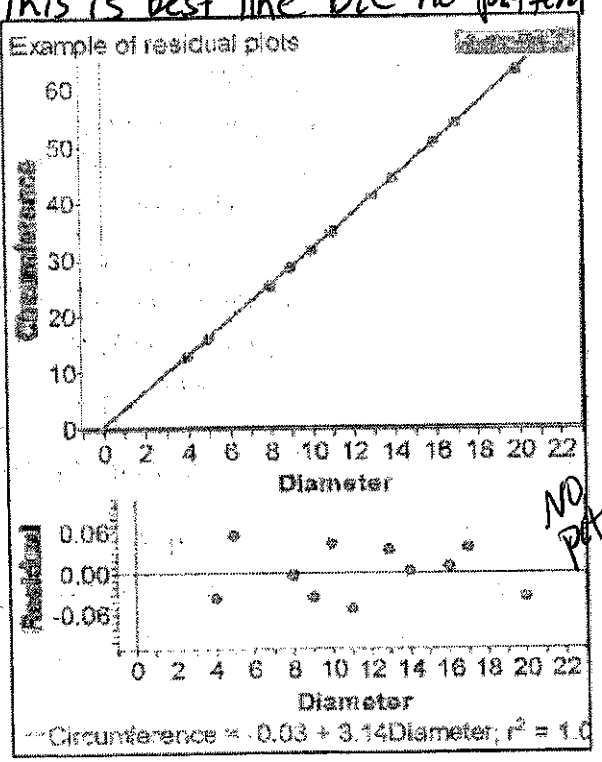
Name: _____ Date: _____

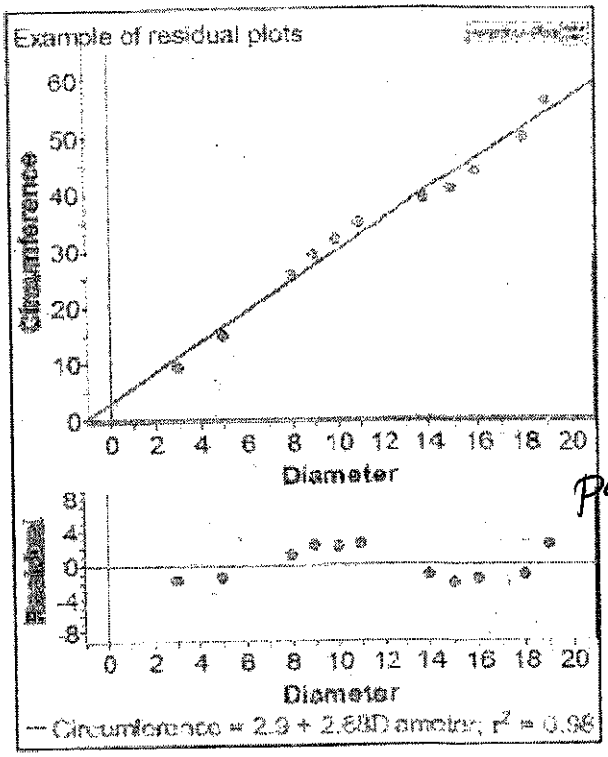
Residuals Homework

Consider the following plots made for the circumference of a ball vs. the diameter of the ball. Based on the corresponding residual plots, which graphs would you think that the linear model is a good fit for?

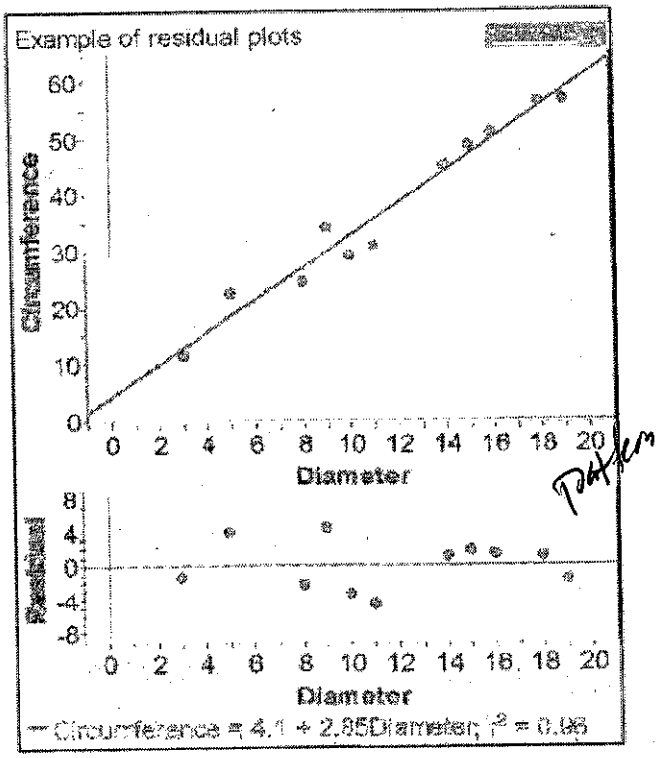
This is best line b/c no pattern



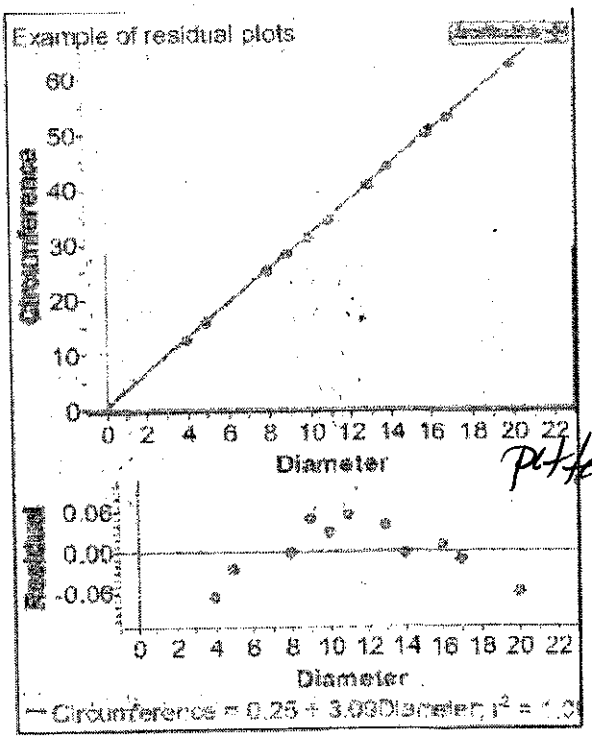
No Pattern



Pattern



Pattern



Pattern

Consider the following data:

The shoe sizes and heights (in inches) for men.

Shoe Size (x)	Height (y)
8.5	66.0
9.0	68.5
9.0	67.5
9.5	70.0
10	70.0
10	72.0
10.5	71.5
10.5	69.5
11.0	71.5
11.0	72
11.0	73
12.0	73.5
12.0	74
12.5	74

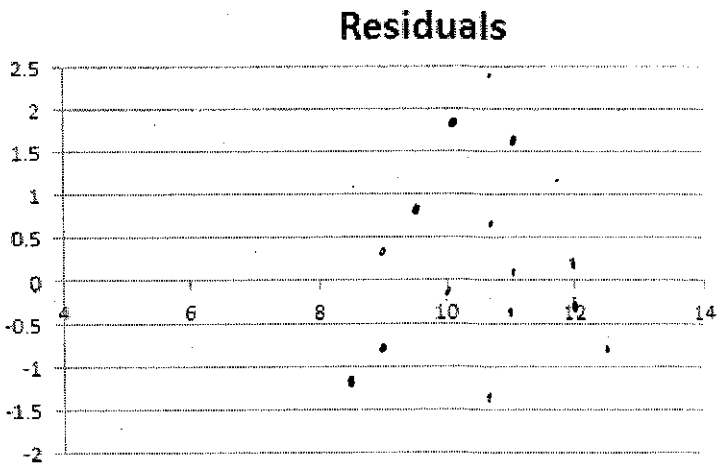
1. **Find the equation for the line of best fit, as well as the correlation coefficient.**

$y = 1.87x + 51.36$ $r = .93$

2. **The equation of the line you just wrote is called a prediction equation. For each shoe size (x), calculate the predicted value of y and the residual.**

x y

Shoe Size (x)	Predicted Height	Residual (Actual-Predicted)
8.5	67.26	-1.26
9.0	68.19	.31
9.0	68.19	-.69
9.5	69.13	.87
10	70.06	-.06
10	70.06	1.94
10.5	70.99	.51
10.5	70.99	-1.49
11.0	71.93	-.43
11.0	71.93	.07
11.0	71.93	1.07
12.0	73.8	-.3
12.0	73.8	.2
12.5	74.74	-.74



3. **Is there a pattern? Is the prediction line the best model for the data? How can you tell?**

No pattern = good line of best fit !!