Exponential Models

$$y = ab^x$$

initial value (when x = 0)

rate of increase or

decrease

Fit an exponential curve to the data.

	_				
X	1	3	4	5	
y	3.00	6.75	10.13	15.19	

y= 1.9998 (1.5001)

increase

1. The average price of an adult ticket to the movies in the United States has increased,

a. Use the movie price data to plot y versus year x. Represent the years 1948, 1958,... as x = 0, 10,

b. linear or exponential?

d. price of a movie ticket in 2000?

e. price of a movie ticket in 2010?

X = year	Y = price
1948 🔘	\$0.36
1958	\$0.68
1967	\$1.22
1978 30	\$2.34
1988	\$4.11

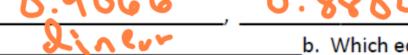
** when you want to plug in values for x, use vars, y-vars then type in x value in parentheses

* when you want to find x -values put the given y value in y= usually for y2 might need to press ZOOM 9 or change window mannually for y max

2.	A study of nutrition in developing counties collected data from the Egyptian village of Nahya. He	ere are
	the mean weights for 170 infants in Nahya who were weighed each month during their first year	of life.

Age (in months) 1 2 3 4 5 6 7 8 9 10 11 12 Mean Wt. (kg) 4.3 5.1 5.7 6.3 6.8 7.1 7.2 7.2 7.2 7.2 7.5 7.8

a. Find the correlation coefficient for each type of equation. (linear, exponential) round to 4 places



_b. Which equation best fits the data?

3. Brian wanted to determine the relationship that might exist between speed and miles per gallon of an automobile. Let x be the average speed of a car on the highway measured in miles per hour and let Y represent the miles per gallon of the automobile. The following data are collected.

X	50	55	55	60	60	62	65	65
Y	28	26	25	22	20	20	17	15

Plot the data. Find the regression equation and correlation coefficient (r). $\sqrt{2} - 0.9715$ Interpret what the slope means. 200

Predict the miles per gallon of a car traveling 61 miles per hour.

Predict the speed of a car that gets 24 miles per gallon. ((1)= 17.9714 wills)

4. A doctor wished to determine whether a relationship exists between the height of a female and weight. She obtained the heights and weights of 10 females aged 18-24. Let height be the independent variable, measured in inches, and weight be the dependent variable, Y, measured in pounds.

X	60	61	62	62	64	65	65	67	68	68
y	105	110	115	120	120	125	130	135	135	145

- a) Plot the data. Find the regression equation and correlation coefficient (r). C 0.9638
 b) Interpret what the clope means. C 164 1650 in C 166 2.4 1650 in
- c) Predict the weight of a female aged 18 to 24 whose height is 66 inches.
- d) Predict the height of a female whose weight is 122 pounds.

5. Suppose you are studying frogs that live in a nearby wetland area. The data below was collected by a local conservation organization. They indicate the number of frogs estimated to be living in the wetland

area over a 5-year period. 4 = 120.3 448 (0.84 L)

a. Write the exponential equation to model this data.

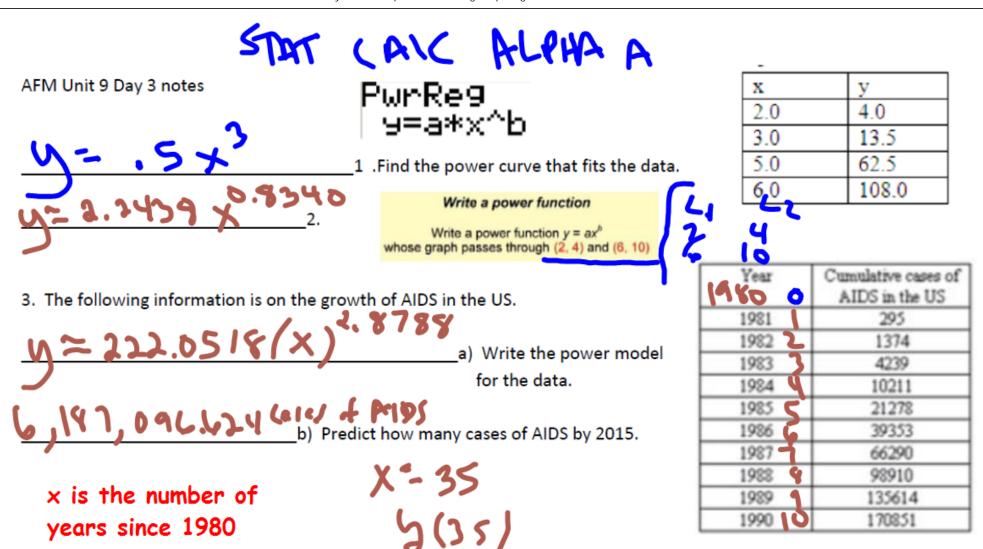
b. What will the population be in 8 years? (18)=30.787

c. What will be the population in 2020?

(3(14)= 10.7606 fugs

Estimated Population
120
101
86
72
60

Frog population decreases at a rate of about 16% per year



POWER FUNCTIONS CAN NOT HAVE ZERO IN THE DATA FOR X

years since 1980

Choosing the Best Model

After reading a problem, you are unsure as to which regression would be best, calculate all 3 on your calculator, then use the r-value to determine which equation is the best one.

4. Write the best model for the data. Then predict the unknown y-value.

a.

141	100				
X	У				
0.3	8.011				
1.5	1.591				
2	0.8112				
5	0.01426				
1.4	?1.820				

Exes whil

42 12.0000 (.2600)^X
74% rate of decrease

b.			
1 - 132 9058	X	У	
lin 120.8958	0.5	0.02031	
exp (= .9145	2	7.879	
	2.5	20.57	
PUT (= .9999	4	155.2	
	7	1722	
9(3)	3	? 45.0506	
		, ,4.3	0
9 =	-400	0(X)	
a			

5. The table shows the average salaries (in thousands of dollars) of major league baseball players for selected years from 1967-1989

selected years from 1507 1505.			10	12	14	10	20	45	
	year 1966	, 0	1967	1976	1979	1982	1984	1986	1989
	salary (in tho	usands)	19.0	51.5	114	242	329	413	497

- a. What is the correlation coefficient for a linear model for this data? O. 9218
- b. What is the correlation coefficient for a exponential model for this data? 0, 9 % 4
- c. What is the correlation coefficient for a power model for this data? 0. 4963
- d. Which model best fits the data? exponential
- e. What is the best model equation?

Estimate the average salary in 1970.

17.67% rate of increase in salary per year

x = years since 1966