

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Regression**

**A little vocab...**

- The line of best fit is the line that lies as close as possible to all the data points.
- Regression is a method used to find the equation of the best fitting line or curve.
- Predictive Modelling is the use of the regression curve to make predictions outside the domain of values of the independent variable.
- Regression Equation is used to make predictions within the domain of values of the independent variable.

**Regression using the calculator:**

1. DATA DATA 4 (this will clear all data already in the tables)
2. DATA (type in data)
3. 2<sup>nd</sup> DATA
4. 4) LinReg ax + b (for linear regression)
- 9) ExpReg ab<sup>x</sup> (for exponential regression)
- 5) QuadReg ax<sup>2</sup> + bx + c (for quadratic regression)
- L1 L2 ONE YES CALC
5. a =  
   b =  
   c =  
   r =
6. Correlation Coefficient is r (use r<sup>2</sup> for quadratic)

Ex 1: The table shows the total outstanding consumer debt (excluding home mortgages) in billions of dollars in selected years. (Data is from the Federal Reserve Bulletin.)

Let x = 0 correspond to 1985.

Year, t	1985 0	1990 5	1995 10	2000 15	2003 18
Consumer Debt	585	789	1096	1693	1987

Year  
- zero  
Year

- Find the line of best fit. Round to two decimal places.  
 $y = 79.86x + 463.35$   
 $r = .98$
- Find and interpret the slope of the line of best fit.  
Change in y / Change in x As x changes, what happens with y?  
Each year, consumer debt goes up 79.86 billion dollars.
- Find the approximate consumer debt in 1998.  
 $\frac{1998 - 1985}{13}$   $y = 79.86(13) + 463.35$   $F(13) = 1,501.52$  billion dollars
- Find the approximate consumer debt in 2008.  
 $\frac{2008 - 1985}{23}$   $F(23) = 2,300.11$  billion dollars

Ex 2: 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.

$$y = 94.17x - 53.43 \quad r = .93$$

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

$$y = 20.51(1.92)^x \quad r = .999$$

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

Exponentially,  $r$  is ~~more~~ closer to 1.

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

$$f(10) = 14,245.42$$

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

$$f(24) = 135,520,033.1$$

Ex 3: Amery recorded the distance and height of a basketball when shooting a free throw.

- a) Find the quadratic equation for the relationship of the horizontal distance and the height of the ball. Round to 3 decimal places.

$$y = -0.118x^2 + 2.112x + 4.215$$

- b) Using this function what is the approximate maximum height of the ball?



$$h = -\frac{b}{2a} \quad k = f(h)$$

$$13.675 \text{ Ft}$$

Distance(feet), x	Height (feet), f(x)
0	4
2	8.4
6	12.1
9	14.2
12	13.2
13	10.5
15	9.8