

## Regression Problems Math

The data for these problems is from Math 142, Dr Lacey, Packet 118.

1. A Tomahawk Cruise ship in the South Pacific misfires a missile. The missile goes over the side of the ship and hits the water. In the data,  $x$  is the number of seconds after the missile is launched and  $y$  is the number of feet above water for the missile.

$x$		0	0.5	1	1.5	2	2.5	3
$y$		128	140	144	140	128	108	80

View the data in a stat plot. Which function we studied might best fit this data?

Find the regression model and paste it to a function.

After how many seconds will the missile hit the water?( according to your model)

What does the model predict the height will be after 4 seconds?

2. The table shows the amount of money, in billions of dollars, spent on pollution control in the U.S. for the years 1983 to 1986.

Year		1983	1984	1985	1986
\$spent		61.8	68.9	74.6	78.7

in bill.

Let  $x$  be the number of years past 1983. View the data in a stat plot. Find a cubic regression model. What is  $r^2$ ?

Extend the data list to include	1987	1988	1989
	81.5	86.1	91.3

Compare the cubic and quartic regression models. Which is a better fit of the existing data? What does each predict for 1990?

3. A department store begins selling swimsuits in January. The table shows the cumulative total number of suits sold by the end of each month.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
4	12	25	58	230	439	648	748	769

Let  $x=1$  be Jan,  $x=2$  be Feb, etc. View the data in a stat plot. Which model would you choose? What is the limiting total number of swimsuits sold, according to this model?

4. A company surveyed 1000 people who owned one of its washing machines. The data shows the number of machines that had a first servicing  $x$  years after purchase.

Years before 1st service	5	10	15	20	25	30
Number of machines	787	619	487	383	301	237

a) Fit an exponential model to this data and write it down.

b) Replace the  $y$  list with  $\ln y$  (take the natural log of the numbers in the 2nd list and use this for list 2) What does the stat plot look like? What model would you choose?

5. The data shows the average brain weight as a % of body weight for different ages.

$x$	0	2	4	6	8	10	12	14	16
$y$	11	8	7	6	5	4.5	4	3.5	3.25

We will fit an exponential model to this data. But since exponential models level off at  $y=0$ , and this seems to level off at  $y=3$ , we will subtract 3 from all the  $y$  values to get a better fit.

Enter the  $x$  values in list 1 and the  $y$  values  $-3$  in list 2.

Do the exponential and quartic regression models.

Which fits the existing data better?

Which makes more sense, especially for predicting the %brain/body weight at age 20?