Quadratic Regression #1 Name:

Directions: Show your work in the space provided.

1) On Tuesday, May 10, 2005, 17 year-old Adi Alifuddin Hussin won the boys' shot-putt gold medal for the fourth consecutive year. His winning throw was 16.43 meters. A shot-putter throws a ball at an inclination of 45° to the horizontal. The following data represent approximate heights for a ball thrown by a shot-putter as it travels a distance of x meters horizontally.

Distance (m)	Height (m)
7	8
20	15
33	24
47	26
60	24
67	21

a) What type of page do you need to enter the data on your TI Nspire calculator?

Lists and Spreadsheets

b) Graph the data. What shape does the data form?

Quadratic

c) What type of page do you add to graph the data? Data and Statistics

d) Write a regression equation for the data. Record your equation and R^2 value.
(Remember, you should you do your regression on the spreadsheet page if you want the R^2 value)

$f(x) = -0.011x^2 + 1.06x + 0.24$ $r^2 = 0.97$

f) Use your equation to predict the height after the ball has traveled 80 meters. Explain how you found your answer.

$f(80) = -0.011(80)^2 + 1.06(80) + 0.24$ $y = 14.64$ Height is 14.64 meters.

g) Add a graph page and graph your function (it should be in f1). What is the maximum height? 25.5
At what distance does it occur? 47.7

2) The concentration (in milligrams per liter) of a medication in a patient's blood as time passes is given by the data in the following table:

Time (Hours)	Concentration (mg/l)
0	0
0.5	78.1
1	99.8
1.5	84.4
2	50.1
2.5	15.6

a) Graph the data on your calculator. What shape does it form?

Quadratic

b) Do a regression equation on the data, record your R^2 value.

$f(x) = -56.21x^2 + 139.3x + 9.35$ $r^2 = 0.92$

c) How much medication is left after 3 hours? Explain or show how you found your answer.

$f(3) = -56.21(3)^2 + 139.3(3) + 9.35$ $y = -78.64$

d) Graph the function. Determine the maximum concentration of medicine and when it occurs.

Maximum concentration is 95.7 mg/l at 1.24 hours.

e) Which of the two models(#1 or #2) has a better fit? Explain how you know.

Model #1 has the better fit because the r^2 value is closer to one than model #2.

Quadratic Regression Name: _____

3) At 1821 feet tall, the CN Tower in Toronto, Ontario, is the world's tallest self-supporting structure. [Note: This information is taken from College Algebra: A Graphing Approach by Larson, Hostetler, & Edwards (Third Edition), page 202.]

Suppose you are standing in the observation deck on top of the tower and you drop a penny from there and watch it fall to the ground. The table below shows the penny's distance from the ground as it is falling.

Time (seconds)	Distance (feet)
0	1821
2	1757
4	1565
6	1245
8	797
10	221

a) Graph the data on your calculator

b) What type of graph does it appear to be?

Quadratic

c) Write a regression equation for the data. Record your R^2 value.

$f(x) = -16x^2 + 0x + 1821$ $r^2 = 1$

d) What is the distance in feet after 10.5 seconds?

$f(10.5) = -16(10.5)^2 + 1821$ $y = 57$

e) How many seconds will it take for the penny to hit the ground? Explain how you found your answer.

It will take 10.7 seconds for the penny to hit the ground.

4)

The table below lists the number of Americans (in thousands) who are expected to be over 100 years old for selected years. [Source: US Census Bureau.]

	Year	Number (thousands)
0	1994	50
2	1996	56
4	1998	65
6	2000	75
8	2002	94
10	2004	110

a) Graph the data on your calculator.

b) What type of graph does it appear to be?

Quadratic

c) Write a regression equation for the data. What is the R^2 value?

$f(x) = 0.4x^2 + 2.04x + 50.1$

d) According to the model, how many thousands of people will be over 100 years old in the year 2008? Does the answer make sense? 2008 → 14

$f(14) = 0.4(14)^2 + 2.04(14) + 50.1$

$y = 157.06$