4.3 Modeling with Quadratic Functions – Regression

Quadratic Regression	The process of finding the equation of the parabola that best fits a set of data		
	Enter Data	**View Data**	**Find Curve**
	• Hit **STAT, ENTER** • Enter **x-values** in L_1 • Enter **y-values** in L_2	• Hit **2nd → y=** • Turn Stat Plot **ON** in menu 1 • Hit **ZOOM 9**	• Hit **STAT** • Arrow over to **CALC** • Choose **#5-QuadReg** • Hit **ENTER** (possibly twice)

Examples

1. An amusement park ride takes riders to the top of a tower and drops them. The table shows the height, *h*, of the tower at time *t* seconds after the drop.

t	0	0.5	1	1.5	2
h	200	164	120	68	8

a. Write an equation for the curve of best fit.

$y = -16x^2 - 64x + 200$

b. How many seconds will it take the tower to reach the ground?

How high is the tower after .75 sec

~~time~~

~~2324~~ 143 ft

2. Braden jumped off a cliff and into the ocean while vacationing in Hawaii. His height *h* after time *t* seconds is given in the table below.

t	0	1	2	3	4
h	480	482	452	390	296

a. Write an equation for the curve of best fit.

$y = -16x^2 + 18x + 480$

b. Predict the maximum height of Braden's jump.

$\frac{-18}{2(-16)} = \frac{9}{16} \rightarrow y = 485.062$ ft

3. Sarah is standing on a bridge that stands 50 feet above the water. She tosses a coin into the water. The height, *h*, of the coin at time *t* seconds is given in the table below.

t	0	0.5	1	1.5	2
h	50	64	70	68	58

a. Write an equation for the curve of best fit.

$y = -16x^2 + 36x + 50$

b. What is the height of the coin after 3 seconds?

$-16(3^2) + 36(3) + 50$

14 ft

4. The table below shows how wind affects a runner's performance in the 200 meter dash, where s represents the speed of the wind in meters per second and t represents the change in the finishing time. Negative wind speed means the runner is running against the wind while positive wind speed means the runner is running with the wind.

s	-4	-2	0	2	4
t	1.48	0.6	0	-0.5	-1.52

a. Write an equation for the curve of best fit.

$y=-0.003x^2-0.355x+0.038$

b. Predict the change in finishing time when the wind is -8 meters per second.

$-0.003(-8)^2-0.355(-8)+0.038$

2.686 seconds

5. A study compared the speed in mile per hour, x, and the average fuel economy in miles per gallon, y, for cars. The results are shown in the table below.

x	20	30	40	50	60	70
y	25.2	28.5	30.1	30.4	27.8	25.0

a. Write an equation for the curve of best fit.

$y=-0.008x^2+0.752x+13.553$

b. Predict the fuel economy for a car traveling at 35 miles per hour.

$-0.008(35)^2+0.752(35)^2+13.553$

30.072

6. The table below shows the average sale price, p, of a house in Norfolk, Virginia in thousands of dollars during various years, t.

	5	6	7	8	9	10 . . .
t	2005	2006	2007	2008	2009	2010
p	158	145	132	130	138	142

a. Write an equation for the curve of best fit.

$y=3.018x^2-48.211x+323.857$

b. Predict the value of the house in 2020.

$3.018(20)^2-48.211(20)+323.857$

$566,837

7. The table below shows the predicted temperatures, y, for different times, x, on a summer day in Denver, CO.

	6	9	12	15	18	21
x	6 AM	9 AM	12 PM	3 PM	6 PM	9 PM
y	63	76	86	89	85	76

a. Write an equation for the curve of best fit.

$y=-0.329x^2+9.798x+15.571$

b. Predict the high temperature for the day. When does this temperature occur?

$\frac{-9.798}{2(-0.329)}=14.89 \rightarrow$ 2:53

88.52°