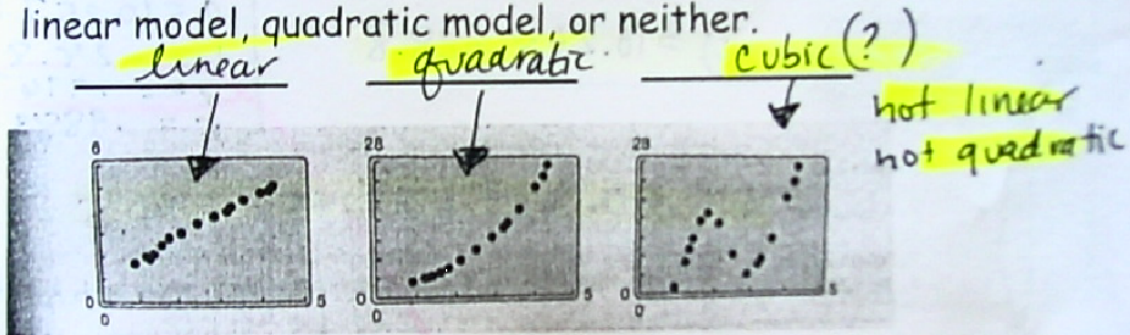


2.8 Quadratic Models

Recall: A scatterplot can be used to show a relationship between two variables.

Decide which model best fits the data:
linear model, quadratic model, or neither.



Recall: Linear model - $f(x) = mx + b$

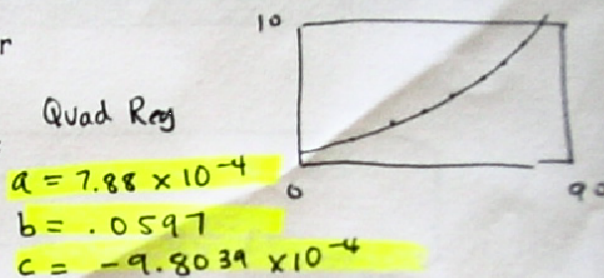
Quadratic model - $f(x) = ax^2 + bx + c$

Example 1: The time y (in seconds) required to attain a speed of x miles per hour from a standing start for an automobile is shown in the table.

DATA	Speed, x	0	20	30	40	50	60	70	80
	Time, y	0	1.4	2.6	3.8	4.9	6.3	8.0	9.9

(a) Create a scatterplot using your calculator.

(b) Use the regression feature of the graphing utility to find the model that best fits the data.



(c) Use the model to estimate how long it takes the automobile (from start) to reach a speed of 55 mph.

$$y = ax^2 + bx + c$$

$$y = 0.0008x^2 + .06x - .0009$$

$$\begin{array}{r|l} 55 & 5.7191 \end{array}$$

5.7 sec

Example 2: The table shows the numbers y (in thousands) of full-size, alternative fueled vehicles in the use from 2005 - 2011. Use the regression feature of a calculator to find the linear AND quadratic model for the data. Determine which model better fits the data.

Year	Number of alternative fueled vehicles (in thousands), y
2005	19.2
2006	31.3
2007	44.9
2008	59.8
2009	64.2
2010	72.1
2011	81.3

Linear

$$y = 10.26x - 28.8$$


$$\begin{cases} y = ax + b \\ a = 10.25714286 \\ b = -28.8 \\ r^2 = .9767 \\ r = .9883 \end{cases}$$

Quadratic

$$y = -0.76x^2 + 22.45x - 74.5$$

$$\begin{cases} y = ax^2 + bx + c \\ a = -.761904 \\ b = 22.4476 \\ c = -74.51428 \\ r^2 = .992955 \end{cases}$$

Quadratic is a better model



Technology Tip

When you use the *regression* feature of a graphing utility, the program may output an " r^2 -value." This r^2 -value is the *coefficient of determination* of the data and gives a measure of how well the model fits the data. The coefficient of determination for the linear model in Example 4 is $r^2 = 0.9608$, and the coefficient of determination for the quadratic model is $r^2 = 0.9962$. Because the coefficient of determination for the quadratic model is closer to 1, the quadratic model better fits the data.

2.8 HW	Assignment #1
pages 165-167	#1-8 all, 17, 21-24 all