CUBIC REGRESSION In Examples 1 and 3, you found a cubic model that *exactly* fits a set of data points. In many real-life situations, you cannot find a simple model to fit data points exactly. Instead, you can use the *regression* feature of a graphing calculator to find an nth-degree polynomial model that best fits the data.

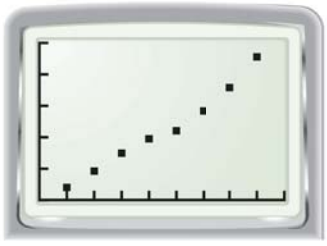
EXAMPLE 4 TAKS REASONING: Multi-Step Problem

SPACE EXPLORATION The table shows the typical speed y (in feet per second) of a space shuttle x seconds after launch. Find a polynomial model for the data. Use the model to predict the time when the shuttle's speed reaches 4400 feet per second, at which point its booster rockets detach.

x	10	20	30	40	50	60	70	80
y	202.4	463.3	748.2	979.3	1186.3	1421.3	1795.4	2283.5

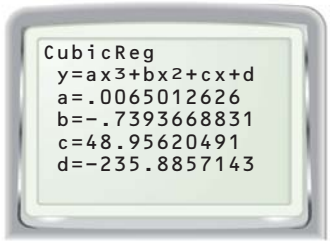
Solution

STEP 1 **Enter** the data into a graphing calculator and make a scatter plot. The points suggest a cubic model.



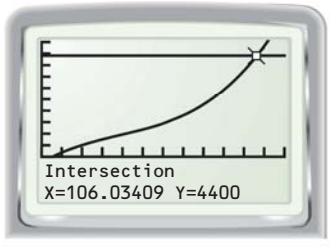
STEP 2 **Use** cubic regression to obtain this polynomial model:

$y = 0.00650x^3 - 0.739x^2 + 49.0x - 236$



STEP 3 **Check** the model by graphing it and the data in the same viewing window.

STEP 4 **Graph** the model and $y = 4400$ in the same viewing window. Use the *intersect* feature.



▶ The booster rockets detach about 106 seconds after launch.

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ANOTHER WAY

You can also find the value of x for which $y = 4400$ by subtracting 4400 from the right side of the cubic model, graphing the resulting function, and using the *zero* feature to find the graph's x-intercept.

GUIDED PRACTICE for Example 4

Use a graphing calculator to find a polynomial function that fits the data.

5.

x	1	2	3	4	5	6
$f(x)$	5	13	17	11	11	56

6.

x	0	2	4	6	8	10
$f(x)$	8	0	15	69	98	87