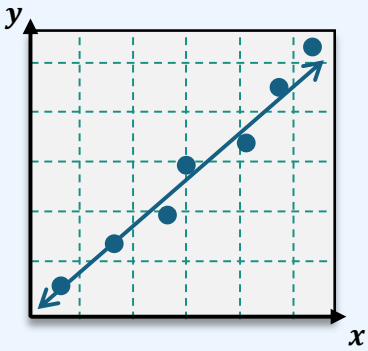
TOPIC: QUADRATIC REGRESSION

Quadratic Regression Using a TI-84

◆ Not all data will fit a linear model. A common model for nonlinear data that "curves" is a quadratic equation. $(ax^2 + bx + c)$

Recall — Linear Regression

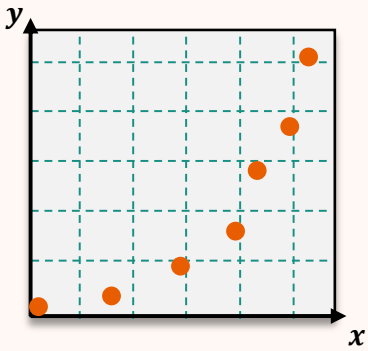


$\hat{y} = b_1x + b_0$ *(textbook)*

OR

$\hat{y} = ax + b$ *(calculator)*

New — Quadratic Regression



$\hat{y} = \_\_\_x^2 + b_1x + b_0$ *(textbook)*

OR

$\hat{y} = ax^2 + bx + c$ *(calculator)*

◆ Typically you'll use technology to do quadratic regression. For TI-84s, use the **5:QuadReg** function.

EXAMPLE

A toy store tracks the sales of a popular new toy over 9 weeks. Use a graphing calculator to graph the quadratic regression curve. Write the regression equation and determine the R^2 value. Is this curve a good fit for the data?

Toy Sales over Weeks									
Week	1	2	3	4	5	6	7	8	9
Sales	17	33	42	48	51	47	40	36	15

HOW TO: Quadratic Reg. on TI-84

1) STAT, **1:Edit…**
   Enter data in **L1** & **L2**

2) STAT, > **CALC**
   v **5:QuadReg**

3) **Xlist:L1**
   Ylist:L2
   FreqList:

4) **Store RegEQ**:
   VARS > **Y-VARS**
   1:Function…, 1:Y_1
   Calculate

5) WINDOW, set **Xmin Xmax**

6) GRAPH

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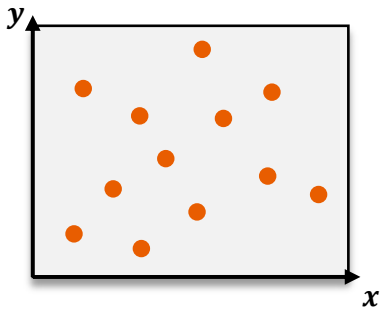
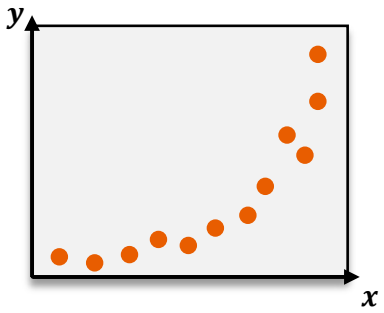
PRACTICE

For the data points in the graphs below, which most likely suggests a quadratic relationship?

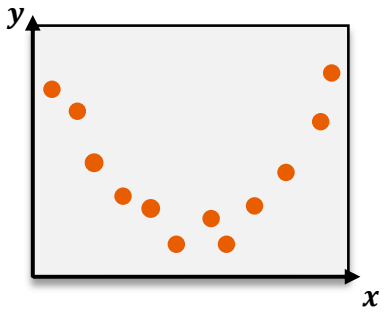
(A)



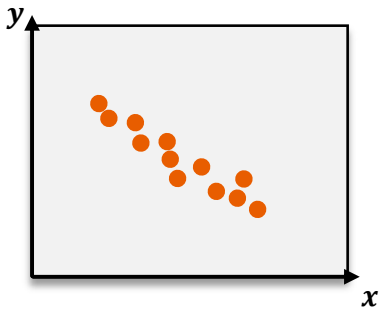
(B)



(C)



(D)



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PRACTICE

The data below shows the population of a small town (in 1000s) over a 9-year period. Using a graphing calculator, determine the linear & quadratic regression curves. Compare their R^2 values. Which model is a better fit for the data?

Population Change Over Years									
Year	1	2	3	4	5	6	7	8	9
Population (1000s)	48	48.6	50.6	53.3	57.6	62.9	70.1	77.3	86.6

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2) [STAT], [>] `CALC`
   [v] `5:QuadReg`

3) `Xlist:L1`
   `Ylist:L2`
   `FreqList:`

4) `Store RegEQ`:
   [VARS] [>] `Y-VARS`
   `1:Function…, 1:Y1`
   `Calculate`

5) [WINDOW], set `Xmin Xmax`

6) [GRAPH]

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EXAMPLE

An industrial plant tracks the average cost/unit of one of its components. The data for 8 production runs is shown below. Determine the quadratic regression curve and the R^2 value. Is this a good fit for the data? Use the regression equation to predict the average cost/unit for 100 units. Is it in the plant's best interest to increase output to 100?

Average Cost Per Unit in Manufacturing								
Output x (Units)	20	30	40	50	60	70	80	90
Average Cost y ($)	15.7	13.8	11.2	9.9	8	8.7	10.4	14.6

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6) GRAPH