**Notes 15.3** Fitting Polynomial Functions to Data

1. What kind of function does this appear to be?

| | X | Y | | | |
|---|---|---|---|---|---|
| +1 | -1 | 80 | -36 | +30 | -12 |
| +1 | 0 | 44 | -6 | +18 | |
| +1 | 1 | 38 | +12 | +6 | |
| +1 | 2 | 50 | +18 | | |
| | 3 | 68 | | | |

Because the 3rd diff. are constant, it's a cubic function.

Write the equation algebraically.

$f(x) = ax^3 + bx^2 + cx + d$ 4 unknowns, so need 4 pts.

$$a(-1)^3 + b(-1)^2 + c(-1) + d = 80$$
$$a(0)^3 + b(0)^2 + c(0) + d = 44$$
$$a(1)^3 + b(1)^2 + c(1) + d = 38$$
$$a(2)^3 + b(2)^2 + c(2) + d = 50$$

$$\Rightarrow \quad -1a + 1b - 1c + d = 80$$
$$0a + 0b + 0c + d = 44$$
$$a + b + c + d = 38$$
$$8a + 4b + 2c + d = 50$$

$$[A] = \left[\begin{array}{cccc|c} -1 & 1 & -1 & 1 & 80 \\ 0 & 0 & 0 & 1 & 44 \\ 1 & 1 & 1 & 1 & 38 \\ 8 & 4 & 2 & 1 & 50 \end{array}\right]$$

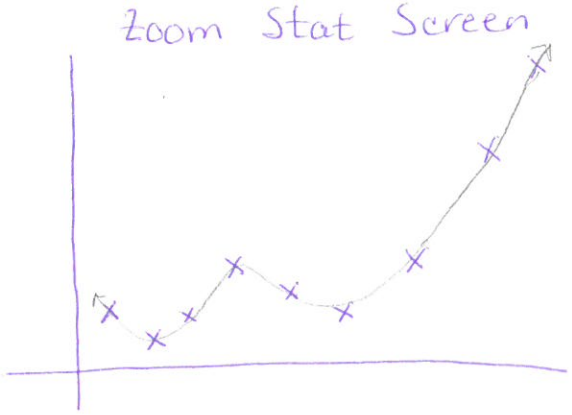
$$\text{rref}[A] = \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & 15 \\ 0 & 0 & 1 & 0 & -19 \\ 0 & 0 & 0 & 1 & 44 \end{array}\right]$$

$a = -2 \quad b = 15 \quad c = -19 \quad d = 44$

$$f(x) = -2x^3 + 15x^2 - 19x + 44$$

2. A store carries various sizes of TVs. The price for a TV is a function of the screen size, measured in inches along the diagonal. X is screen size, Y is the price in dollars.

| X | Y |
|---|---|
| 2 | 160 |
| 5 | 100 |
| 7 | 120 |
| 12 | 250 |
| 17 | 220 |
| 21 | 200 |
| 27 | 340 |
| 32 | 680 |
| 35 | 1100 |




a) Make a scatterplot of the data. What kind of function does this appear to be?

See above (4 branches) Quartic (see pencil marking)

b) Do a regression test to find appropriate equation.

$f(x) = .006x^4 - .329x^3 + 6.18x^2 - 36.62x + 193.096$

c) Based on this model of best fit, $\hat{y}$, which size TV is most overpriced? (to find the residuals calculate y - $\hat{y}$ in L3 )

12" TV because its residual (54.273) is the largest.