1. **Problem 17.6** Use least-squares regression to fit a straight line to

*X* 1 2 3 4 5 6 7 8 9

*y* 1 1.5 2 3 4 5 8 10 13

1. Along with the slope and intercept, compute the standard error of the estimate and the correlation coefficient. Plot the data and the straight line. Assess the fit.

|  |  |
| --- | --- |
| Ymean | 5.277777778 |
| a1 (Slope) | 1.458333333 |
| a0 (Intercept) | -2.013888889 |
| Standard deviation Sy | 4.176654695 |
| standard error Sy/x | 1.306652697 |
| Sy/x < Sy | the linear regression model has merit |
| R^2 | 0.914361067 |

These results indicate that 91.436 percent of the original uncertainty has been explained by the linear model.

1. Recompute **(a)**, but use polynomial regression to fit a parabola to the data. Compare the results with those of **(a)**.

Y=a0+a1\*x+a2\*x^2.

The computations for the error analysis, setting up of linear equations and gauss elimination in the excel file.

|  |  |
| --- | --- |
| a0 | 1.488095238 |
| a1 | -0.451839827 |
| a2 | 0.191017316 |
| Sx/y | 0.344771292 |
| r^2 | 0.994863214 |

The standard error of the polynomial regression is lower than the least square method standard error. These results indicate that 99.486 percent of the original uncertainty has been explained by the polynomial regression model. This result supports the conclusion that the quadratic equation model is superior to the linear model.

1. Use the data from problem 18.5 to predict the value of the function at x=2.8. Use fifth order interpolating polynomial.

*x* 1.6 2 2.5 3.2 4 4.5 *f* (*x*) 2 8 14 15 8 2

the fifth order polynomial with n=5

f5(x)=B0+B1(x-x0)+B2(x-x0)(x-x1)(+B3(x-x0)(x-x1)(x-x2)(+B4(x-x0)(x-x1)(x-x2)(x-x3)+B5(x-x0)(x-x1)(x-x2)(x-x3)(x-x4)

Calculations of the table above are in excel file.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | x | 1.6 | 2 | 2.5 | 3.2 | 4 | 4.5 |
| B0 | F(x) | 2 | 8 | 14 | 15 | 8 | 2 |
| B1 | F(xi,xi-1) | 15.000 | 12.000 | 1.429 | -8.750 | -12.000 |  |
| B2 | F(xi,xi-1,xi-2) | -3.333 | -8.810 | -6.786 | -2.500 |  |  |
| B3 | F(xi,xi-1,xi-2xi-3) | -3.423 | 1.012 | 2.143 |  |  |  |
| B4 | F(xi,xi-1,xi-2xi-3,xi-4) | 1.848 | 0.452 |  |  |  |  |
| B5 | F(xi,xi-1,xi-2,xi-3,xi-4,xi-5) | -0.481 |  |  |  |  |  |

B0= 2, B1=15, B2=-3.333 B3=-3.423 B4=1.848 B5=-0.481

**Solving for F(2.8) = 15.534**

I plotted the interpolation equation between 1 and 5 to see how it models the data. The polynomial equation models the data well in the data interval