Section 4.2

High-Order Polynomial Fits

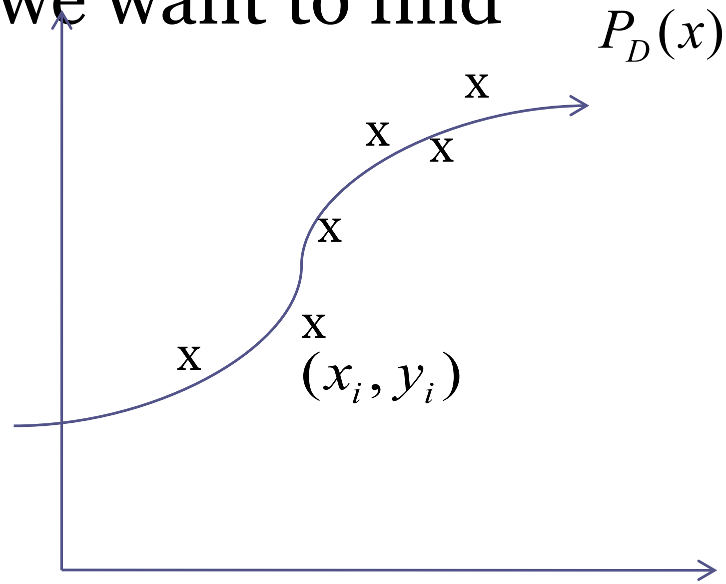
Polynomial Fits

Given a set of data points $(x_i, y_i)_{i=1}^{N}$, and a degree D of a polynomial, we want to find

$$k_0 \ldots\ldots\ldots k_D$$

such that

$$P_D(x) = k_0 + k_1 x + \ldots\ldots\ldots + k_D x^D$$



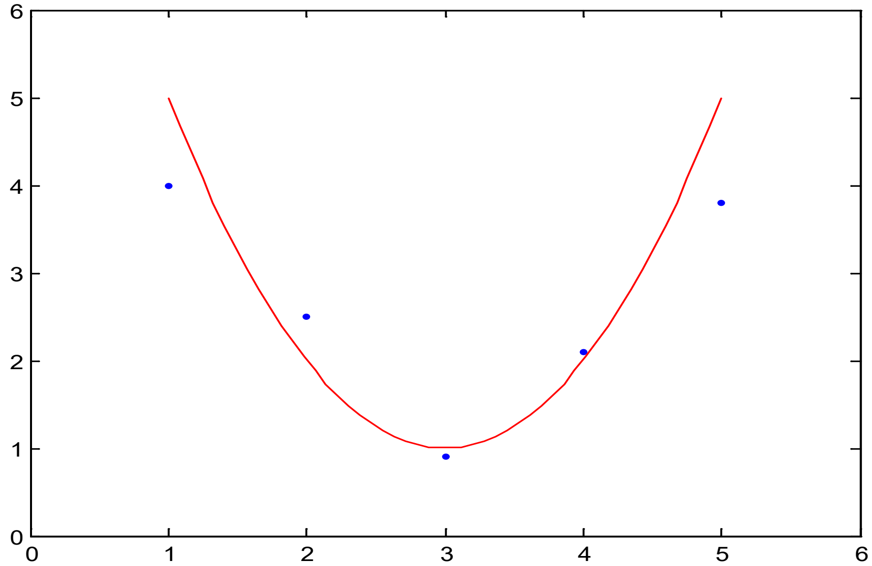
Note: D<N

$$\{(x_i, y_i)\}_{i=1}^{N} \xrightarrow{Polyfit} Coefficients\ p$$

Matlab's Polyfit:

$$p = polyfit(x, y, k)$$

$$\vec{p} = \begin{bmatrix} p_1 \\ p_2 \\ \cdot \\ \cdot \\ p_{k+1} \end{bmatrix}$$



$$app(x) = p_1 x^k + p_2 x^{k-1} + .. + p_k x + p_{k+1}$$

Example: Given a set of cricket chirps versus the temperature

- >>F = [46 49 51 52 54 56 57 58 59 60 61 62 63 64 66 67 68 71 72 71];
- >>C = [40 50 55 63 72 70 77 73 90 93 96 88 99 110 113 120 127 137 132 137];
- We first plot the data points to examine its behavior
- >>plot(F,C,'.'); hold on
- Suppose we want to fit the data with a second degree polynomial
- >>k = 2; P = polyfit(F,C,k)
- Next we want to plot the results to see how well the polynomial fits.
- >>X=linspace(min(F),max(F),101); % create some new grid points
- >>Y=polyval(P,X); % evaluate the polynomial at the new grid points
- >>plot(X,Y,'r');hold off;axis tight;
- legend('Data', [num2str(k) '-degree polynomial fit'], 2)
- xlabel('F^o');ylabel('Chirp/Minute');

HW: 4.2 (2, 4)