Övning 2 (2011-11-10)

1 Interpolation

- **Linear interpolation** (similar to Bradie p.352, 5.1.14)
  A thermodynamics student needs the temperature of saturated steam under pressure of 6.3 mega-Pascals (MPa).
  Estimate the temperature using linear interplation from the following data

Pressure (MPa)	Temperature (°C)
6.0	275
7.0	285

- **Polynomial of degree at most n**
  We would like to determine the polynomial of degree at most 3 which interpolates the following data.

x	-3	1	2	5
y	-23	-11	-23	1

  Write down the linear equation system which has to be solved to determined the coefficients of the polynomial.

- **Newton form** (similar to ENM 5.5)
  Consider the data set

x	-1	0	1
y	5	1	3

  Construct the Newton form of the interpolating polynomial and determine its extremum. The Newton form of the polynomial interpolating $x_0, \cdots, x_n$

$$P_{\text{newton}}(x) = \sum_{k=0}^{n} a_k \prod_{i=0}^{k-1} (x - x_i)$$

- **Error in piecewise linear interpolation** (Bradie p.392 exercise 5.15.11, similar to ex. 5.15)
  Suppose that a table lists the values of the tangent function for angles ranging from 0 to $pi/4$ in increments of 0.01. What is the largest error that we would introduce by performing linear interpolation between successive values in this table?

2 Least square method (minstakvadratmetoden)

We would like to find the linear function $l(x) = c_1 + c_2 x$ to the given data which minimizes the error.

x	2	3	4
l(x)	4	5	1

Calculate the coefficients c_1 and c_2 with help of the least square method.