



## Problems on least squares method

1) Find the polynomials  $P_1^*$  и  $P_2^*$  by the least squared method with the data tables:

a) 
$$\begin{array}{c|c|c|c|c|c|c} x & -2 & -1 & 0 & 1 & 2 & 3 \\ \hline y & -4 & 15 & 1 & 10 & 7 & 6 \end{array}$$

Answer:

$$P_1^* = x + \frac{16}{3}; \quad P_2^* = -x^2 + 2x + 8$$

б) 
$$\begin{array}{c|c|c|c|c|c|c|c} x & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\ \hline y & 7 & 4 & -1 & 1 & 5 & 6 & 13 \end{array}$$

Answer:

$$P_1^* = x + 5; \quad P_2^* = x^2 + x + 1$$

2) The function  $y = \sin(\pi x)$  is tabulated in the nodes  $\pm 1$ ,  $\pm 1/2$  and 0. Construct the polynomial  $P_3^*$  by the least square method for the derived matrix.

Answer:  $P_3^* = \frac{8}{3}(x - x^3)$ .

3) After preliminarily transformation find the specified polynomial below for the given data table using the least square method

a)  $P = e^{a+bx}$  for: 
$$\begin{array}{c|c|c|c} x & -1 & 0 & 1 \\ \hline y & e^2 & e^3 & e^4 \end{array}$$

Answer:  $P^* = e^{x+3}$

b)  $P = a + \frac{b}{x}$ , 
$$\begin{array}{c|c|c|c|c|c} x & 1 & 2 & 4 & 5 & 10 \\ \hline y & 2 & 1,5 & 1,25 & 1,2 & 1,1 \end{array}$$

Answer:  $P^* = 1 + \frac{1}{x}$

4) By using the least square method solve the predeterminate systems

a) 
$$\begin{cases} x + y = 3 \\ 2x - y = 1 \\ x + 2y = 5 \end{cases}, \quad \text{b) } \begin{cases} x + y = 1 \\ x + z = 1 \\ y + z = 1 \\ x + y + z = 1 \end{cases}, \quad \text{c) } \begin{cases} x + y = 1 \\ x + y = -1 \\ x - y = 1 \\ x - y = -1 \end{cases}, \quad \text{d) } \begin{cases} x + y = 3 \\ 2x - y = 0,2 \\ x + 3y = 7 \\ 3x + y = 5 \end{cases}.$$

Answer: a)  $x \approx 1,37, y \approx 1,77$ ; b)  $x = y = z = \frac{3}{7}$ ;

c)  $x = y = 0$ ; d)  $x \approx 1,037, y \approx 1,968$ .