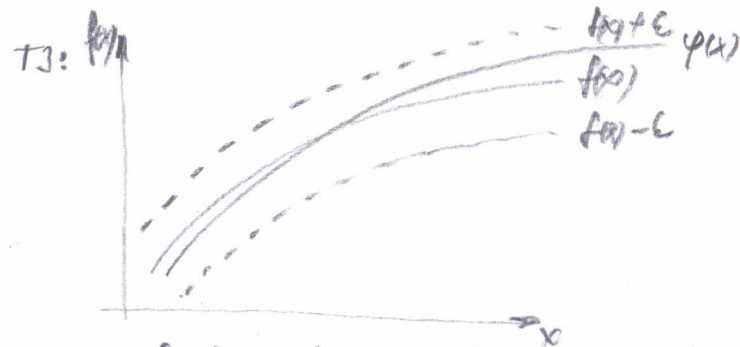


RESEN' UKAZOVÉ ZKOUŠKY

T1: $E(x) = |x - \tilde{x}|$

T2: $q = \frac{\text{REL. CH. VÝSTUPNÍHO DAT}}{\text{REL. CH. VSTUPNÍHO DAT}}$



T4: $a_0(1|1) + q(x|1) = (f|1)$
 $a_0(1|x) + q(x|x) = (f|x)$

T5: Lomenov Canon

① $2x_1 + x_2 - x_3 = 2$
 $x_1 + 2x_2 + x_3 = 4$
 $2x_1 - x_2 - x_3 = 0$

$Ax = b$
 $L \cdot Ux = b$
 y

$L \cdot y = b \quad \begin{pmatrix} 2 & 0 & 0 \\ 1 & 3/2 & 0 \\ 2 & -2 & 2 \end{pmatrix} \cdot \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ 0 \end{pmatrix}$

$U \cdot x = y \quad \begin{pmatrix} 1 & 1/2 & -1/2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$

$A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 2 & 1 \\ 2 & -1 & -1 \end{pmatrix} = \begin{pmatrix} L & \text{change} & U \end{pmatrix} = \begin{pmatrix} 2 & 0 & 0 \\ 1 & 3/2 & 0 \\ 2 & -2 & 2 \end{pmatrix} \cdot \begin{pmatrix} 1 & 1/2 & -1/2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

$2 = l_{11} \quad 1 = l_{21} \quad 2 = l_{31}$
 $1 = 2u_{12} \quad 2 = \frac{1}{2} + l_{22} \quad -1 = 1 + l_{32}$
 $-1 = 2u_{13} \quad 1 = -\frac{1}{2} + \frac{3}{2}u_{23} \quad -1 = -1 - 2 + l_{33}$

$2y_1 - 2 \rightarrow y_1 = 1$
 $y_1 + \frac{3}{2}y_2 = 4 \rightarrow y_2 = 2$
 $2y_1 - 2y_2 + 2y_3 = 0 \rightarrow y_3 = 1$
 $y = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$

$x_3 = 1$
 $x_2 + x_3 = 2 \rightarrow x_2 = 1$
 $1 + \frac{1}{2}x_2 - \frac{1}{2}x_3 = 1 \rightarrow x_1 = 1$

$x = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$

② $A = L \cdot U$
 $A^{-1} = U^{-1} \cdot L^{-1}$

$\left(\begin{array}{ccc|ccc} 1 & 1/2 & -1/2 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array} \right) \xrightarrow{\cdot \frac{1}{2}} \left(\begin{array}{ccc|ccc} 1 & 1/2 & 0 & 1 & 0 & 1/2 \\ 0 & 1 & 0 & 0 & 1 & -1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array} \right) \xrightarrow{\cdot \frac{1}{2}} \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1/2 & 1 \\ 0 & 1 & 0 & 0 & 1 & -1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array} \right) \quad U^{-1} = \begin{pmatrix} 1 & -1/2 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$

$\left(\begin{array}{ccc|ccc} 2 & 0 & 0 & 1 & 0 & 0 \\ 1 & 3/2 & 0 & 0 & 1 & 0 \\ 2 & -2 & 2 & 0 & 0 & 1 \end{array} \right) \xrightarrow{\cdot \frac{1}{2}} \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1/2 & 0 & 0 \\ 0 & 3/2 & 0 & -1/2 & 1 & 0 \\ 0 & -2 & 2 & -1 & 0 & 1 \end{array} \right) \xrightarrow{\cdot \frac{2}{3}} \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 0 & -1/3 & 2/3 & 0 \\ 0 & 0 & 2 & -5/3 & 2/3 & 1 \end{array} \right) \xrightarrow{\cdot \frac{1}{2}} \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 0 & -1/3 & 2/3 & 0 \\ 0 & 0 & 1 & -5/6 & 1/3 & 1/2 \end{array} \right) \quad L^{-1} = \begin{pmatrix} 1/2 & 0 & 0 \\ -1/3 & 2/3 & 0 \\ -5/6 & 1/3 & 1/2 \end{pmatrix}$

$A^{-1} = U^{-1} \cdot L^{-1} = \begin{pmatrix} 1 & -1/2 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1/2 & 0 & 0 \\ -1/3 & 2/3 & 0 \\ -5/6 & 1/3 & 1/2 \end{pmatrix} = \begin{pmatrix} -1/6 & 1/3 & 1/2 \\ 1/2 & 0 & -1/2 \\ -5/6 & 2/3 & 1/2 \end{pmatrix}$

zk.: $\begin{pmatrix} 2 & 1 & -1 \\ 1 & 2 & 1 \\ 2 & -1 & -1 \end{pmatrix} \cdot \begin{pmatrix} -1/6 & 1/3 & 1/2 \\ 1/2 & 0 & -1/2 \\ -5/6 & 2/3 & 1/2 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

③ $x^3 - 3x^2 - 3x - 4 = 0 \quad x \in \langle 3, 7 \rangle$

$f(x) = x^3 - 3x^2 - 3x - 4$

$f'(x) = 3x^2 - 6x - 3 > 0 \quad \} f(x) - f(x_0) > 0 \Rightarrow x_0 = 7$

$f''(x) = 6x - 6 > 0$

IV: $x_{k+1} = x_k - \frac{x_k^3 - 3x_k^2 - 3x_k - 4}{3x_k^2 - 6x_k - 3}$

k	$x_k = A - \frac{A^3 - 3A^2 - 3A - 4}{3A^2 - 6A - 3}$	
0	7	A
1	5,323 529 412	A
2	4,407 408 645	A
3	4,056 503 906	A
4	4,001 320 901	A
5	4,000 000 747	A
6	4	A
7	<u>4</u>	PB

④

x	f(x)	Δ_1	Δ_2	Δ_3	Δ_4
-2	①	$\frac{1-0}{-1-(-2)} = \frac{1}{1}$ ①	$\frac{1-1}{0-(-2)} = 0$ ①	$\frac{-\frac{3}{2}-0}{1-(-2)} = \frac{-\frac{3}{2}}{3}$ ①	$\frac{1-(-\frac{1}{2})}{2-(-2)} = \frac{\frac{3}{2}}{4}$
-1	1	$\frac{2-1}{0-(-1)} = \frac{1}{1}$ 1	$\frac{2-1}{1-(-1)} = \frac{1}{2}$	$\frac{\frac{3}{2}-(-\frac{3}{2})}{2-(-1)} = \frac{3}{1}$ 1	$\frac{3}{8}$
0	2	$\frac{0-2}{1-0} = -2$	$\frac{1-(-2)}{2-0} = \frac{3}{2}$		
1	0	$\frac{1-0}{2-1} = \frac{1}{1}$ 1			
2	1				

$N_4(x) = 0 + 1(x+2) + 0(x+2)(x+1) - \frac{1}{2}(x+2)(x+1)x + \frac{3}{8}(x+2)(x+1)x(x-1) =$

$= x + 2 - \frac{1}{2}(x^3 + 3x^2 + 2x) + \frac{3}{8}(x^4 + 2x^3 - x^2 - 2x)$

$N_4(x) = \frac{3}{8}x^4 + \frac{1}{4}x^3 - \frac{15}{8}x^2 - \frac{3}{4}x + 2$

⑤ $\int_{-1}^3 (\arctan^2 x + x + 1) dx = \frac{h}{2} [B + 2(C + 1 + D + E + F + X + Y) + M] = 10,87186162$

$n=8 \quad h = \frac{3-(-1)}{8} = \frac{1}{2}$

n	x_n	$f(x_n)$
0	-1	0,616 850 275 B
1	-1/2	0,714 969 105 C
2	0	1
3	1/2	1,714 969 105 D
4	1	2,616 850 275 E
5	3/2	3,465 883 502 F
6	2	4,225 778 283 X
7	5/2	4,916 790 164 Y
8	3	5,580 115 342 M