Красена Давидова, 45185, 1-ва група, вариант 18

Зад.

|u'' - xu = (1+x)sinx + (1-x)cosx
|u'(0)=1
|u(2pi) = -1

Диференчна схема:

Нека f_i = (1+x)sinx + (1-x)cosx. Тогава:

$$\frac{y_{i+1}-2y_i+y_{i-1}}{h^2}-x_i y_i=f_i$$

$$(\frac{1}{h^2})y_{i+1}-(\frac{2}{h^2}+x_i)y_i+\frac{1}{h^2}y_{i-1}=f_i$$

За i = 1..n-1 имаме

$$A_i=\frac{1}{h^2};B_i=\frac{1}{h^2};C_i=\frac{-2}{h^2}-x_i$$

За i = 0 имаме

$$\frac{1}{h^2}y_{-1}-\frac{2}{h^2}y_0+\frac{1}{h^2}y_1=f_0 \quad \text{и} \quad \frac{y_1-y_{-1}}{2h}=1$$

→

$$\frac{-2}{h^2}y_0+\frac{2}{h^2}y_1=f_0+\frac{2}{h}$$

$$A_0=0;B_0=\frac{2}{h^2};C_0=\frac{-2}{h^2};f_0=f_0+\frac{2}{h}$$

За i= n имаме (по условие)

$$A_n=0;B_n=0;C_n=-1;f_n=1$$

1. N = 10

X:	y(h):	y(h/2):	y(h/4):	Alfa:
0	-3.53244	-3.380848201	-3.34474	2.07029
0.628319	-2.70673	-2.642928201	-2.62769	2.06663
1.25664	-2.05587	-2.029898201	-2.02383	2.09999
1.88496	-1.60895	-1.593888201	-1.59038	2.10734
2.51327	-1.16819	-1.156638201	-1.15387	2.0667
3.14159	-0.587926	-0.5796058201	-0.577575	2.03522
3.76991	0.108626	0.1141148201	0.115475	2.01249
4.39823	0.744669	0.7508048201	0.75241	1.93294
5.02655	1.06146	1.07678201	1.08096	1.83642
5.65487	0.730643	0.7655748201	0.775912	1.75655
6.28319	-1	-18201	-1	nan

2. N = 20

X:	y(h):	y(h/2):	y(h/4):	Alfa:
0	-3.38084	-3.344748201	-3.33583	2.01827
0.314159	-3.01733	-2.99328201	-2.98724	2.01647
0.628319	-2.64292	-2.627698201	-2.62392	2.01692

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0.942478	-2.30827	-2.298848201	-2.29652	2.02009
1.25664	-2.02989	-2.023838201	-2.02234	2.02505
1.5708	-1.79927	-1.794958201	-1.79389	2.02848
1.88496	-1.59388	-1.590388201	-1.58952	2.02733
2.19911	-1.38721	-1.384138201	-1.38338	2.02255
2.51327	-1.15663	-1.153878201	-1.15319	2.01698
2.82743	-0.888305	-0.8858898201	-0.88529	2.01231
3.14159	-0.579605	-0.5775758201	-0.577071	2.00894
3.45575	-0.239252	-0.2376058201	-0.237195	2.0064
3.76991	0.114114	0.1154758201	0.115814	2.00281
4.08407	0.454396	0.4556898201	0.456013	1.99431
4.39823	0.750804	0.752418201	0.752818	1.9798
4.71239	0.97006	0.9725758201	0.97322	1.96481
5.02655	1.0767	1.080968201	1.08207	1.95209
5.34071	1.02899	1.036018201	1.03784	1.94036
5.65487	0.765574	0.7759128201	0.778628	1.92825
5.96903	0.171696	0.1831548201	0.186192	1.9151
6.28319	-1	-18201	-1	nan