

```

• begin
•     import Pkg;     Pkg.activate()
•
•     using DataFrames
• end

```

Activating project at `~/julia/environments/v1.8`



Метод сеток решения ОДУ

$$y''(x) - 0.21^3 y(x) = -0.21^2 x, 0 \leq x \leq 1$$

$$y(0) = 1, y(1) = e^5 + 1$$

p (generic function with 1 method)

```
• p(x) = 0
```

q (generic function with 1 method)

```
• q(x) = 0.21^3
```

f (generic function with 1 method)

```
• f(x) = -0.21^2 * x
```

(1, 1)

```
• α₀, α₁ = 1, 1
```

(0, 0)

```
• β₀, β₁ = 0, 0
```

(1, 2.23368)

```
• γ₀, γ₁ = 1, exp(0.21)+1
```

h = 0.1

```
• h = 0.1
```

x = 0.0:0.1:1.0

```
• x = 0:h:1
```

a, b, c, t

```
a = [1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]
```

```
• a = 1 .+ h/2 * p.(x)
```

```
b =
```

```
[-2.00009, -2.00009, -2.00009, -2.00009, -2.00009, -2.00009, -2.00009, -2.00009, -2.00009,
```

```
• b = -(2 .+ h^2 * q.(x))
```

```
c = [1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]
```

```
• c = 1 .- h/2 * p.(x)
```

```
t =
```

```
[-0.0, -4.41e-5, -8.82e-5, -0.0001323, -0.0001764, -0.0002205, -0.0002646, -0.0003087, -0.
```

```
• t = h^2 * f.(x)
```

	a	b	c	t
1	1.0	-2.00009	1.0	-0.0
2	1.0	-2.00009	1.0	-4.41e-5
3	1.0	-2.00009	1.0	-8.82e-5
4	1.0	-2.00009	1.0	-0.0001323
5	1.0	-2.00009	1.0	-0.0001764
6	1.0	-2.00009	1.0	-0.0002205
7	1.0	-2.00009	1.0	-0.0002646
8	1.0	-2.00009	1.0	-0.0003087
9	1.0	-2.00009	1.0	-0.0003528
10	1.0	-2.00009	1.0	-0.0003969
11	1.0	-2.00009	1.0	-0.000441

```
• DataFrame(  
•     a=a,  
•     b=b,  
•     c=c,  
•     t=t  
• )
```

(1.0, 0.0)

• $\alpha_{01}, \alpha_{02} = \alpha_0 - \beta_0/h, -\beta_1/h$

(0.0, 1.0)

• $\beta_{01}, \beta_{02} = \beta_0/h, \alpha_1 + \beta_1/h$

(1, 2.23368)

• $\gamma_{01}, \gamma_{02} = \gamma_0, \gamma_1$

X, Z

true

• `all(abs.(b) .≥ abs.(c) + abs.(a))`

([-0.0], [1.0])

• $X, Z = [-\beta_{01}/\alpha_{01}], [\gamma_{01}/\alpha_{01}]$

```
• for i in 1:10
•     push!(
•         X,
•         -a[i] / (b[i] + c[i]*X[i])
•     )
•     push!(
•         Z,
•         (t[i] - c[i]*Z[i]) / (b[i] + c[i]*X[i])
•     )
• end
```

	X	Z
1	-0.0	1.0
2	0.499977	0.499977
3	0.666615	0.333322
4	0.749919	0.25003
5	0.799889	0.200102
6	0.833192	0.166871
7	0.856971	0.143192
8	0.874798	0.125496
9	0.888656	0.111797
10	0.899736	0.100905
11	0.908796	0.0920628

```

• DataFrame(
•     X=X,
•     Z=Z
• )

```

Y

```
Y = [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]
```

```
• Y = zeros(11)
```

```
2.317344446137041
```

```

• Y[end] = ([
•     1 -X[end]
•     α0 2 β0 2
• ] \ [Y0 2, Z[end]])[1]

```

```

• for i in 11:-1:2
•     Y[i-1] = Y[i] * X[i] + Z[i]
• end

```

	x	Y
1	0.0	1.11974
2	0.1	1.23957
3	0.2	1.35948
4	0.3	1.47943
5	0.4	1.59938
6	0.5	1.71931
7	0.6	1.83917
8	0.7	1.95894
9	0.8	2.07858
10	0.9	2.19806
11	1.0	2.31734

```
• DataFrame(  
•     x=x,  
•     Y=Y  
• )
```