

## ЗАДАНИЕ

### для лабораторной работы №9

Тема: Решение обыкновенных дифференциальных уравнений (ОДУ) 2-го порядка. Задача Коши

1. Решить задачу Коши для обыкновенного дифференциального уравнения 2-го порядка на отрезке  $x \in [a; b]$  при заданных начальных условиях  $y(a)=C$ ,  $y'(a)=D$  и шаге интегрирования  $h$  методом Эйлера, Рунге-Кутты 2-го порядка в MS Excel и встроенными функциями в MathCad. Построить графики функций.
2. Сделать выводы.

№	Дифференциальное уравнение	Начальные условия	Интервал и шаг
1.	$x^2 y'' + 3xy' + 4y - 5x = 0$	$y(1) = 6,$ $y'(1) = 8,$	$x \in [1, 2], h = 0.1$
2.	$x^4 y'' + 2x^3 y' + y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1, 2], h = 0.1$
3.	$(x-2)^2 y'' - (x-2)y' - 3y = 0$	$y(3) = 2,$ $y'(3) = 2,$	$x \in [3, 4], h = 0.1$
4.	$x^2 y'' + xy' - y - 3x^2 = 0$	$y(1) = 3,$ $y'(1) = 2,$	$x \in [1, 2], h = 0.1$
5.	$xy'' - (x+1)y' + y = 0$	$y(1) = 2 + e,$ $y'(1) = 1 + e,$	$x \in [1, 2], h = 0.1$
6.	$(x^2 - 1)y'' - 2xy' + 2y = 0$	$y(2) = 7,$ $y'(2) = 5,$	$x \in [2, 3], h = 0.1$
7.	$y'' + 2y' \operatorname{ctg}(x) + 3y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1, 2], h = 0.1$
8.	$y'' - 2\operatorname{tg}(x)y' - 3y = 0$	$y(0) = 1,$ $y'(0) = 3,$	$x \in [0, 1], h = 0.1$
9.	$(x^2 + 1)y'' - 2xy' + 2y = 0$	$y(0) = 1,$ $y'(0) = 1,$	$x \in [0, 1], h = 0.1$
10.	$y'' + y' \operatorname{tg}(x) - y \cos^2(x) = 0$	$y(0) = 2,$ $y'(0) = 0,$	$x \in [0, 1], h = 0.1$
11.	$y'' - 4xy' + (4x^2 - 2)y = 0$	$y(0) = 1,$ $y'(0) = 1,$	$x \in [0, 1], h = 0.1$
12.	$xy'' + y' = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1, 2], h = 0.1$
13.	$y'' + \frac{1}{x}y' + \frac{2}{x}y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1, 2], h = 0.1$
14.	$y'' - \frac{x+1}{x}y' - 2\frac{x-1}{x}y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1, 2], h = 0.1$

15.	$x(x-1)y'' + \frac{1}{2}y' - \frac{3}{4}y = 0$	$y(2) = \sqrt{2},$ $y'(2) = \frac{3}{2}\sqrt{2},$	$x \in [2,3], h = 0.1$
16.	$y'' - 2tg(x)y' - 3y = 0$	$y(0) = 1,$ $y'(0) = 3,$	$x \in [0,1], h = 0.1$
17.	$y'' + 4xy' + (4x^2 + 2)y = 0$	$y(0) = 1,$ $y'(0) = 1,$	$x \in [0,1], h = 0.1$
18.	$y'' + y'tg(x) + y \cos^2(x) = 0$	$y(0) = 0,$ $y'(0) = 1,$	$x \in [0,1], h = 0.1$
19.	$x^2y'' + 3xy' + 4y - 5x = 0$	$y(1) = 6,$ $y'(1) = 8,$	$x \in [1,2], h = 0.1$
20.	$x^4y'' + 2x^3y' + y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1,2], h = 0.1$
21.	$(x-2)^2y'' - (x-2)y' - 3y = 0$	$y(3) = 2,$ $y'(3) = 2,$	$x \in [3,4], h = 0.1$
22.	$x^2y'' + xy' - y - 3x^2 = 0$	$y(1) = 3,$ $y'(1) = 2,$	$x \in [1,2], h = 0.1$
23.	$xy'' - (x+1)y' + y = 0$	$y(1) = 2 + e,$ $y'(1) = 1 + e,$	$x \in [1,2], h = 0.1$
24.	$(x^2 - 1)y'' - 2xy' + 2y = 0$	$y(2) = 7,$ $y'(2) = 5,$	$x \in [2,3], h = 0.1$
25.	$y'' + 2y'ctg(x) + 3y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1,2], h = 0.1$
26.	$y'' - 2tg(x)y' - 3y = 0$	$y(0) = 1,$ $y'(0) = 3,$	$x \in [0,1], h = 0.1$
27.	$(x^2 + 1)y'' - 2xy' + 2y = 0$	$y(0) = 1,$ $y'(0) = 1,$	$x \in [0,1], h = 0.1$
28.	$y'' + y'tg(x) - y \cos^2(x) = 0$	$y(0) = 2,$ $y'(0) = 0,$	$x \in [0,1], h = 0.1$
29.	$y'' - 4xy' + (4x^2 - 2)y = 0$	$y(0) = 1,$ $y'(0) = 1,$	$x \in [0,1], h = 0.1$
30.	$xy'' + y' = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1,2], h = 0.1$
31.	$y'' + \frac{1}{x}y' + \frac{2}{x}y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1,2], h = 0.1$
32.	$y'' - \frac{x+1}{x}y' - 2\frac{x-1}{x}y = 0$	$y(1) = 1,$ $y'(1) = 1,$	$x \in [1,2], h = 0.1$
33.	$x(x-1)y'' + \frac{1}{2}y' - \frac{3}{4}y = 0$	$y(2) = \sqrt{2},$ $y'(2) = \frac{3}{2}\sqrt{2},$	$x \in [2,3], h = 0.1$
34.	$y'' - 2tg(x)y' - 3y = 0$	$y(0) = 1,$ $y'(0) = 3,$	$x \in [0,1], h = 0.1$

35.	$y''+4xy'+(4x^2+2)y=0$	$y(0)=1,$ $y'(0)=1,$	$x \in [0,1], h = 0.1$
36.	$y''+y'tg(x)+y\cos^2(x)=0$	$y(0)=0,$ $y'(0)=1,$	$x \in [0,1], h = 0.1$
37.	$x^2y''+3xy'+4y-5x=0$	$y(1)=6,$ $y'(1)=8,$	$x \in [1,2], h = 0.1$
38.	$x^4y''+2x^3y'+y=0$	$y(1)=1,$ $y'(1)=1,$	$x \in [1,2], h = 0.1$
39.	$(x-2)^2y''-(x-2)y'-3y=0$	$y(3)=2,$ $y'(3)=2,$	$x \in [3,4], h = 0.1$
40.	$x^2y''+xy'-y-3x^2=0$	$y(1)=3,$ $y'(1)=2,$	$x \in [1,2], h = 0.1$