-1	-	-14 7 -7	-3 3 -3	-	-	-	-17	17
0	-	-	-2 2 0	0 50 0	2 2 0	-	0	0
1	-	-	-1 1 1	0 10 10	6 6 6	-	5	5
2	-	-	-	0 4 8	7 7 14	6 3 6	13	26
$V = \sum n_{uv} v$	-4	-13	-2	18	20	6		$\sum vU = 72$
uV	12	26	2	0	20	12	$\sum uV = 72$	↑ ← ***Контроль***

Далее находим h_1 и h_2, $\bar{x}$ и $\bar{y}$, σ_x и σ_y:

$$h_1 = 9 - 4 = 5;\ h_2 = 20 - 10 = 10;$$
$$\bar{x} = \bar{u} \cdot h_1 + C_1 = -0{,}11 \cdot 5 + 19 = 18{,}45;$$
$$\bar{y} = \bar{v} \cdot h_2 + C_2 = 0{,}25 \cdot 10 + 30 = 32{,}5; \quad \sigma_x = h_1 \cdot \sigma_u = 5 \cdot 0{,}95 = 4{,}75;$$

Подставив найденные величины в формулу (6), получим

$$\bar{y}_x - 32{,}5 = 0{,}82 \cdot \frac{9{,}7}{4{,}75}(x - 18{,}45), \quad \text{или } \bar{y}_x = 1{,}67x + 2{,}2.$$

ЗАДАЧИ ДЛЯ КОНТРОЛЬНЫХ ЗАДАНИЙ

КОНТРОЛЬНАЯ РАБОТА № 7

I. Найти общее решение дифференциального уравнения и частное решение, удовлетворяющее начальному условию $y = y_0$ при $x = x_0$.

1. $y'\sin x - y\cos x = 1;\ y_0 = 0,\ x_0 = \dfrac{\pi}{2}.$

2. $y' - y\sin x = e^{-\cos x}\sin 2x;\ y_0 = 3,\ x_0 = \dfrac{\pi}{2}.$

3. $y' + \dfrac{2y}{x} = -x^2;\ y_0 = 1,\ x_0 = 3.$

4. $y' + y = \dfrac{e^{-x}}{1+x^2};\ y_0 = 2,\ x_0 = 0.$

5. $(1+x^2)y' - 2xy = (1+x^2)^2;\ y_0 = 5,\ x_0 = -2.$

6. $xy' - 2y = x^3\cos x;\ y_0 = 1,\ x_0 = \pi.$

7. $y'x\ln x - y = 3x^3\ln^2 x;\ y_0 = 0,\ x_0 = e.$

8. $y' + 2xy = xe^{-x^2};\ y_0 = 4,\ x_0 = 0.$

9. $y'\cos x - 2y\sin x = 2;\ y_0 = 3,\ x_0 = 0.$

10. $y' - \dfrac{3y}{x} = x^3e^x;\ y_0 = e,\ x_0 = 1.$

11. $xy' - 3y = x^4e^x;\ y_0 = e,\ x_0 = 1.$

12. $y'\cos x + y\sin x = 1;\ y_0 = 2,\ x_0 = 0.$

13. $y' + \dfrac{y}{x} = \dfrac{\sin x}{x};\ y_0 = 1,\ x_0 = \dfrac{\pi}{2}.$

14. $y' - \dfrac{y}{x} = -2\ln x;\ y_0 = 1,\ x_0 = 1.$

15. $xy' + 2y = \dfrac{1}{x};\ y_0 = 1,\ x_0 = 3.$

16. $y' - y\cos x = -\cos x;\ y_0 = 3,\ x_0 = 0.$

17. $y' + 2xy = e^{-x^3}\sin x;\ y_0 = 1,\ x_0 = 0.$

18. $x^2y' + xy + 1 = 0;\ y_0 = 2,\ x_0 = 1.$

19. $y' - ytgx = \dfrac{1}{\cos x};\ y_0 = 5,\ x_0 = 0.$

20. $y' - \dfrac{2y}{x+1} = (x+1)^3;\ y_0 = \dfrac{1}{2},\ x_0 = 0.$

III. Найти общее решение дифференциального уравнения и частное решение, удовлетворяющее начальным условиям.

1. $y''x\ln x = y'$; $y(e) = e-1$, $y'(e) = 1$.
2. $y'''\cos^4 x = -\sin 2x$; $y(\pi) = 0$, $y'(\pi) = 2$, $y''(\pi) = -1$.
3. $2xy'' = y'$; $y(9) = 8$, $y'(9) = 3$.
4. $y'' = y'\ln y'$; $y(0) = 0$, $y'(0) = 1$.
5. $y''(x^2+1) = 2xy'$; $y(0) = 1$, $y'(0) = 3$.
6. $y''\cos x + y'\sin x = 0$; $y(0) = -\dfrac{1}{4}$, $y'(0) = 2$.
7. $y'' + y' = e^{-x}$; $y(0) = 1$, $y'(0) = 1$.
8. $y'' - 6y' + 9y = 9x^2 - 12x + 2$; $y(0) = 1$, $y'(0) = 3$.
9. $y'' + 9y = 36e^{3x}$; $y(0) = 0$, $y'(0) = 0$.
10. $y'' + 2y' - 8y = 3\sin x$; $y(0) = -1$, $y'(0) = -\dfrac{3}{2}$.
11. $y'' + 6y' + 13y = 8e^{-x}$; $y(0) = \dfrac{2}{3}$, $y'(0) = 2$.
12. $y'' - 4y' + 8y = 8x^2 + 4$; $y(0) = 2$, $y'(0) = 3$.
13. $y'' + y' - 5y = 50\cos x$; $y(0) = 3$, $y'(0) = 5$.
14. $y'' + 2y' + 5y = 13e^{2x}$; $y(0) = 1$, $y'(0) = 4$.
15. $y'' - 4y' + 5y = 10x$; $y(0) = 10$, $y'(0) = 6$.
16. $y'' - 4y' + 4y = 3x - x^2$; $y(0) = 3$, $y'(0) = \dfrac{4}{3}$.
17. $y'' - 6y' + 9y = 4e^{x}$; $y(0) = 3$, $y'(0) = 8$.
18. $y'' - 4y' + 4y = -169\sin 3x$; $y(0) = -12$, $y'(0) = 16$.
19. $y'' + 2y' - 8y = 16x + 4$; $y(0) = 2$, $y'(0) = 6$.
20. $y'' - 4y' + 5y = 5x^2 - 4$; $y(0) = \dfrac{2}{25}$, $y'(0) = \dfrac{3}{5}$.

IV. Найти общее решение системы дифференциальных уравнений.

1. $\begin{cases} \dfrac{dx_1}{dt} = 12x_1 + 5x_2 \\ \dfrac{dx_2}{dt} = 5x_1 + 12x_2 \end{cases}$

2. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 3x_2 \\ \dfrac{dx_2}{dt} = x_1 - x_2 \end{cases}$

3. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 4x_2 \\ \dfrac{dx_2}{dt} = x_1 + x_2 \end{cases}$

4. $\begin{cases} \dfrac{dx_1}{dt} = 3x_1 + x_2 \\ \dfrac{dx_2}{dt} = -4x_1 - 2x_2 \end{cases}$

5. $\begin{cases} \dfrac{dx_1}{dt} = x_1 - x_2 \\ \dfrac{dx_2}{dt} = x_2 - x_1 \end{cases}$

6. $\begin{cases} \dfrac{dx_1}{dt} = 2x_1 - 4x_2 \\ \dfrac{dx_2}{dt} = x_1 - 3x_2 \end{cases}$

7. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + x_2 \\ \dfrac{dx_2}{dt} = 4x_2 - 2x_1 \end{cases}$

8. $\begin{cases} \dfrac{dx_1}{dt} = 4x_1 + 5x_2 \\ \dfrac{dx_2}{dt} = x_1 \end{cases}$

9. $\begin{cases} \dfrac{dx_1}{dt} = x_1 - 5x_2 \\ \dfrac{dx_2}{dt} = -2x_1 - 2x_2 \end{cases}$

10. $\begin{cases} \dfrac{dx_1}{dt} = 2x_1 + 6x_2 \\ \dfrac{dx_2}{dt} = 3x_1 - x_2 \end{cases}$

11. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 3x_2 \\ \dfrac{dx_2}{dt} = 2x_1 \end{cases}$

12. $\begin{cases} \dfrac{dx_1}{dt} = 4x_1 - x_2 \\ \dfrac{dx_2}{dt} = -2x_1 + 3x_2 \end{cases}$

13. $\begin{cases} \dfrac{dx_1}{dt} = -3x_1 + 2x_2 \\ \dfrac{dx_2}{dt} = 5x_1 - 6x_2 \end{cases}$

14. $\begin{cases} \dfrac{dx_1}{dt} = x_1 - 2x_2 \\ \dfrac{dx_2}{dt} = -3x_1 - 4x_2 \end{cases}$

15. $\begin{cases} \dfrac{dx_1}{dt} = 4x_1 - x_2 \\ \dfrac{dx_2}{dt} = -2x_1 + 5x_2 \end{cases}$

16. $\begin{cases} \dfrac{dx_1}{dt} = -x_1 + 3x_2 \\ \dfrac{dx_2}{dt} = 2x_1 - 2x_2 \end{cases}$

17. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 2x_2 \\ \dfrac{dx_2}{dt} = 3x_1 - 4x_2 \end{cases}$

18. $\begin{cases} \dfrac{dx_1}{dt} = -3x_1 + 2x_2 \\ \dfrac{dx_2}{dt} = 5x_1 \end{cases}$

19. $\begin{cases} \dfrac{dx_1}{dt} = x_1 - 2x_2 \\ \dfrac{dx_2}{dt} = -3x_1 + 6x_2 \end{cases}$

20. $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 2x_2 \\ \dfrac{dx_2}{dt} = 3x_1 + 2x_2 \end{cases}$

V. Решить уравнение колебания струны методом Фурье.

1. $\varphi(x) = \begin{cases} \dfrac{2hx}{3}; 0 \le x \le \dfrac{3}{2}, \\ 2h(2-x); \, {}^{3}\!/_{2} \le x \le 2; \end{cases} \quad \psi(x) = x(2-x).$

2. $\varphi(x) = \begin{cases} \dfrac{-2hx}{3}; 0 \le x \le \dfrac{3}{2}, \\ \dfrac{2h(x-3)}{3}; \, {}^{3}\!/_{2} \le x \le 2; \end{cases} \quad \psi(x) = x(3-x).$

3. $\varphi(x) = \begin{cases} hx; 0 \le x \le 1, \\ h; 1 \le x \le 2, \\ h(3-x); 2 \le x \le 3; \end{cases} \quad \psi(x) = x(3-x).$

4. $\varphi(x) = \begin{cases} 2hx; 0 \le x \le \dfrac{1}{2}, \\ \dfrac{2h(4-x)}{3}; \, {}^{1}\!/_{2} \le x \le 4; \end{cases} \quad \psi(x) = x(4-x).$

5. $\varphi(x) = \begin{cases} -4hx; 0 \le x \le \dfrac{1}{4}, \\ \dfrac{4h(x-5)}{19}; \, {}^{1}\!/_{4} \le x \le 5; \end{cases} \quad \psi(x) = x(5-x).$

6. $\varphi(x) = \begin{cases} -hx; 0 \le x \le 1, \\ -h; 1 \le x \le 3, \\ h(x-4); 3 \le x \le 4; \end{cases} \quad \psi(x) = x(4-x).$

7. $\varphi(x) = \begin{cases} \dfrac{hx}{3}; 0 \le x \le 3, \\ \dfrac{h(6-x)}{3}; 3 \le x \le 6; \end{cases} \quad \psi(x) = x(6-x).$

8. $$\varphi(x)=\begin{cases}\dfrac{-2hx}{7};\ 0\le x\le \dfrac{7}{2},\\ \dfrac{2h(x-7)}{7};\ 7/2\le x\le 7;\end{cases}\qquad \psi(x)=x(7-x).$$

9. $$\varphi(x)=\begin{cases}\dfrac{hx}{2};\ 0\le x\le 2,\\ h;\ 2\le x\le 4,\\ h(5-x);\ 4\le x\le 5;\end{cases}\qquad \psi(x)=x(5-x).$$

10. $$\varphi(x)=\begin{cases}\dfrac{-hx}{3};\ 0\le x\le 3,\\ -h;\ 3\le x\le 6,\\ h(x-7);\ 6\le x\le 7;\end{cases}\qquad \psi(x)=x(7-x).$$

11. $$\varphi(x)=\begin{cases}\dfrac{2h}{5}x;\ 0\le x\le \dfrac{5}{2},\\ \dfrac{2h}{5}(5-x);\ 5/2\le x\le 5;\end{cases}\qquad \psi(x)=\begin{cases}2x,\ 0\le x\le \dfrac{5}{2}\\ 2(5-x),\ \dfrac{5}{2}\le x\le 5\end{cases}$$

12. $$\varphi(x)=\begin{cases}\dfrac{2h}{3}x;\ 0\le x\le \dfrac{3}{2},\\ \dfrac{2h}{3}(3-x);\ 3/2\le x\le 3;\end{cases}\qquad \psi(x)=\begin{cases}2x,\ 0\le x\le \dfrac{3}{2}\\ 2(3-x),\ \dfrac{3}{2}\le x\le 3\end{cases}$$

13. $$\varphi(x)=\begin{cases}\dfrac{2h}{7}x;\ 0\le x\le \dfrac{7}{2},\\ \dfrac{2h}{7}(7-x);\ 7/2\le x\le 7;\end{cases}\qquad \psi(x)=\begin{cases}4x,\ 0\le x\le \dfrac{7}{2}\\ 4(7-x),\ \dfrac{7}{2}\le x\le 7\end{cases}$$

14. $$\varphi(x)=\begin{cases}\dfrac{2h}{9}x;\ 0\le x\le \dfrac{9}{2},\\ \dfrac{2h}{9}(9-x);\ 9/2\le x\le 9;\end{cases}\qquad \psi(x)=\begin{cases}4x,\ 0\le x\le \dfrac{9}{2}\\ 4(9-x),\ \dfrac{9}{2}\le x\le 9\end{cases}$$

15. $$\varphi(x)=\begin{cases}-\dfrac{2h}{11}x;\ 0\le x\le \dfrac{11}{2},\\ \dfrac{2h}{11}(x-11);\ 11/2\le x\le 11;\end{cases}\qquad \psi(x)=\begin{cases}6x,\ 0\le x\le \dfrac{11}{2}\\ 6(11-x),\ \dfrac{11}{2}\le x\le 11\end{cases}$$