

ОПЕРАЦИОННОЕ ИСЧИСЛЕНИЕ

Задание:

- 1-2. Найти оригинал функции.
- 3-4. Решить дифференциальные уравнения.
5. Решить систему дифференциальных уравнений.

1 Вариант.	2 Вариант.	3 Вариант.
1) $F(p) = \frac{6p+6}{p^3+5p^2+6p}.$	1) $F(p) = \frac{5}{p^3-4p}.$	1) $F(p) = \frac{1}{p^3+3p^2+2p}.$
2) $F(p) = \frac{p^2+2p}{(p^2+2p+2)^2}.$	2) $F(p) = \frac{p+3}{(p^2+6p+10)^2}.$	2) $F(p) = \frac{p+2}{(p^2+4p+8)^2}.$
3) $y''+2y'+3y=2\sin t+2\cos t;$ $y(0)=0; y'(0)=1.$	3) $y''+2y'+3y=-4\sin t+4\cos t;$ $y(0)=2; y'(0)=0.$	3) $y''+2y'+3y=4\sin t+2\cos t;$ $y(0)=0; y'(0)=1.$
4) $2y''+3y'-y=3\sin t+9\cos t;$ $y(0)=-2; y'(0)=1.$	4) $2y''+3y'-y=-3t+11;$ $y(0)=-2; y'(0)=3.$	4) $3y''-2y'+y=-2\sin t-2\cos t;$ $y(0)=0; y'(0)=1.$
5) $\begin{cases} -5x''+10x+9y''+3y=96\cos t \\ 7x''+8x-6y''-2y=-20\cos t \end{cases}.$ $x(0)=4; y(0)=-6; x'(0)=0; y'(0)=0.$	5) $\begin{cases} -5x''+10x=60\cos t \\ 7x''+8x+2y'=-8\cos t \end{cases}.$ $x(0)=4; y(0)=0; x'(0)=0; y'(0)=-6.$	5) $\begin{cases} -x''+6x+5y''-y=-248\sin 5t \\ 3x''+4x-2y''+2y=96\sin 5t \end{cases}.$ $x(0)=0; y(0)=0; x'(0)=0; y'(0)=-10.$

4 Вариант.

1) $F(p) = \frac{p^2 + 3}{p^3 + 2p^2 + p}.$

2) $F(p) = \frac{p+1}{(p^2 + 2p + 2)^2}.$

3) $y'' + 2y' + 3y = 6\sin t + 12\cos t;$

$y(0) = 3; y'(0) = 0.$

4) $3y'' - 2y' + y = 4\sin t - 4\cos t;$

$y(0) = 2; y'(0) = 0.$

5)
$$\begin{cases} -2x'' + 7x + 6y'' = -349e^{4t} - 3y' \\ 4x'' + 5x - 3y'' + 5y' + y = 150e^{4t} \end{cases}$$

$x(0) = 1; y(0) = -3;$

$x'(0) = 4; y'(0) = -12.$

5 Вариант.

1) $F(p) = \frac{4(p+2)}{p^3 + 9p^2 + 20p}.$

2) $F(p) = \frac{p+1}{(p^2 + 2p + 5)^2}.$

3) $y'' + 2y' + 3y = -12e^t;$

$y(0) = -2; y'(0) = -2.$

4) $3y'' - 2y' + y = 4\sin t - 2\cos t;$

$y(0) = 0; y'(0) = 1.$

5)
$$\begin{cases} -x'' + 6x + 5y'' - y = 252\sin 5t \\ 3x'' + 4x - 2y'' + 2y = -104\sin 5t \end{cases}$$

$x(0) = 0; y(0) = 0;$

$x'(0) = 0; y'(0) = -10.$

6 вариант.

1) $F(p) = \frac{1}{p^3 + 7p^2 + 10p}.$

2) $F(p) = \frac{5}{(p^2 + 2p + 10)^2}.$

3) $y'' + 2y' + 3y = 3t + 2;$

$y(0) = 0; y'(0) = 1.$

4) $3y'' - 2y' + y = -6\sin t + 12\cos t;$

$y(0) = 3; y'(0) = 0.$

5)
$$\begin{cases} -2x'' + 7x + 3y' = 75\sin 4t \\ 4x'' + 5x + 5y' = \sin 4t \end{cases}$$

$x(0) = 0; y(0) = -3;$

$x'(0) = 4; y'(0) = 0$

7 Вариант.

$$1) F(p) = \frac{6(p+2)}{p^3 + 7p^2 + 12p}.$$

$$2) F(p) = \frac{3}{(p^2 + 2p + 5)^2}.$$

$$3) y'' + 2y' + 3y = 6\sin t - 2\cos t;$$

$$y(0) = -2; \quad y'(0) = 1.$$

$$4) 3y'' - 2y' + y = -4e^t;$$

$$y(0) = -2; \quad y'(0) = -2.$$

$$5) \begin{cases} -2x'' + 7x + 3y'' = -61\operatorname{sh}4t \\ 4x'' + 5x + 5y' = 9\operatorname{sh}4t \end{cases}.$$

$$x(0) = 0; \quad y(0) = -3;$$

$$x'(0) = 4; \quad y'(0) = 0$$

8 Вариант.

$$1) F(p) = \frac{1}{p^3 + 7p^2 + 12p}.$$

$$2) F(p) = \frac{5}{(p^2 + 4p + 5)^2}.$$

$$3) y'' + 2y' + 3y = 9t;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$4) 3y'' - 2y' + y = t - 2;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -x'' + 6x + 4y' = -40\operatorname{ch}5t \\ 3x'' + 4x + 6y' = -60\operatorname{ch}5t \end{cases}.$$

$$x(0) = 0; \quad y(0) = 0;$$

$$x'(0) = 0; \quad y'(0) = -10$$

9 вариант.

$$1) F(p) = \frac{p^3}{p^4 - 1}.$$

$$2) F(p) = \frac{1}{p^5 + 9p^3}.$$

$$3) y'' - 3y' + 2y = \sin t - 3\cos t;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) 3y'' - 2y' + y = -6\sin t + 2\cos t;$$

$$y(0) = -2; \quad y'(0) = 1.$$

$$5) \begin{cases} -2x'' + 7x + 3y' = 3\cos 4t \\ 4x'' + 5x + 5y' = -119\cos 4t \end{cases}.$$

$$x(0) = 1; \quad y(0) = 0;$$

$$x'(0) = 0; \quad y'(0) = -12$$

10 вариант.

$$1) F(p) = \frac{5}{(p+1)(p^2+5p+6)}.$$

$$2) F(p) = \frac{p^2}{p^4+18p^2+81}.$$

$$3) y'' - 3y' + 2y = 6\sin t + 2\cos t;$$

$$y(0) = 2; \quad y'(0) = 0.$$

$$4) 3y'' - 2y' + y = 3t - 8;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$5) \begin{cases} -2x'' + 7x + 6y'' + 3y' = 7t - 9 \\ 4x'' + 5x - 3y'' + 5y' + y = 9t + 5 \end{cases}.$$

$$x(0) = -3; \quad y(0) = 0;$$

$$x'(0) = 1; \quad y'(0) = 4$$

11 вариант.

$$1) F(p) = \frac{p^3}{p^4 - 16}.$$

$$2) F(p) = \frac{p^2 + p + 1}{(p+1)(p^2 - 4p + 4)}.$$

$$3) y'' - 3y' + 2y = 3\sin t - 3\cos t;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) 3y'' - y' + 2y = -\sin t - \cos t;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -x'' + 6x + 5y'' - y = 252\cos 5t \\ 3x'' + 4x - 2y'' + 2y = -104\cos 5t \end{cases}.$$

$$x(0) = 0; \quad y(0) = -2;$$

$$x'(0) = 0; \quad y'(0) = 0$$

12 вариант.

$$1) F(p) = \frac{5p^2 - 20}{p^4 + 8p^2 + 16}.$$

$$2) F(p) = \frac{5p + 10}{p^3 + 4p^2 + 3p}.$$

$$3) y'' - 3y' + 2y = -9\sin t + 9\cos t;$$

$$y(0) = 3; \quad y'(0) = 0.$$

$$4) 3y'' - y' + 2y = 2\sin t - 2\cos t;$$

$$y(0) = 2; \quad y'(0) = 0.$$

$$5) \begin{cases} -x'' + 6x + 5y'' - y = -248\cos 5t \\ 3x'' + 4x - 2y'' + 2y = 96\cos 5t \end{cases}.$$

$$x(0) = 0; \quad y(0) = -2;$$

$$x'(0) = 0; \quad y'(0) = 0$$

13 вариант.

$$1) F(p) = \frac{3(p^2 - 9)}{p^4 + 18p^2 + 81}.$$

$$2) F(p) = \frac{1}{p^3 + 5p^2 + 6p}.$$

$$3) y'' - 3y' + 2y = 0;$$

$$y(0) = -2; \quad y'(0) = -2.$$

$$4) 3y'' - y' + 2y = 5\text{sh}t - \text{cht};$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -4x'' + 9x + 8y'' + 2y = -191\text{sh}2t \\ 6x'' + 7x - 5y'' - y = 198\text{sh}2t \end{cases}.$$

$$\begin{aligned} x(0) &= 0; & y(0) &= 0; \\ x'(0) &= 6; & y'(0) &= -10 \end{aligned}$$

14 вариант.

$$1) F(p) = \frac{p}{(p^2 - 4)^3}.$$

$$2) F(p) = \frac{54p^2}{p^4 - 81}.$$

$$3) y'' - 3y' + 2y = 2t - 3;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) 3y'' - y' + 2y = -3\text{sh}t + 15\text{cht};$$

$$y(0) = 3; \quad y'(0) = 0.$$

$$5) \begin{cases} -4x'' + 2x' + 9x + 8y'' + 2y' = -189e^{2t} \\ 6x'' + 2x' + 7x - 5y'' + 3y' - y = 180e^{2t} \end{cases}.$$

$$\begin{aligned} x(0) &= 3; & y(0) &= -5; \\ x'(0) &= 6; & y'(0) &= -10 \end{aligned}$$

15 вариант.

$$1) F(p) = \frac{10}{p^4 - 18p^2 + 81}.$$

$$2) F(p) = \frac{32p}{p^4 - 16}.$$

$$3) y'' - 3y' + 2y = -5\text{sin}t - 5\text{cos}t;$$

$$y(0) = -2; \quad y'(0) = 1.$$

$$4) 3y'' - y' + 2y = -8e^t;$$

$$y(0) = -2; \quad y'(0) = -2.$$

$$5) \begin{cases} -4x'' + 9x + 8y'' + 2y = 225\text{sin}2t \\ 6x'' + 7x - 5y'' - y = -146\text{sin}2t \end{cases}.$$

$$\begin{aligned} x(0) &= 0; & y(0) &= 0; \\ x'(0) &= 6; & y'(0) &= -10 \end{aligned}$$

16 вариант.

$$1) F(p) = \frac{8}{p^4 - 8p^2 + 16}.$$

$$2) F(p) = \frac{6p}{p^4 - 1}.$$

$$3) y'' - 3y' + 2y = 6t - 13;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$4) 3y'' - y' + 2y = 2t - 1;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -x'' + 6x + 4y' = -40\cos 5t \\ 3x'' + 4x + 6y' = -60\cos 5t \end{cases}.$$

$$\begin{aligned} x(0) &= 0; & y(0) &= 0; \\ x'(0) &= 0; & y'(0) &= -10 \end{aligned}$$

17 вариант.

$$1) F(p) = \frac{p^2 + 6p + 5}{(p^2 + 6p + 13)^2}.$$

$$2) F(p) = \frac{p + 3}{p^3 - 4p^2 + 4p}.$$

$$3) 2y'' - y' + y = -\sin t - \cos t;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) 3y'' - y' + 2y = -3\sin t + \cos t;$$

$$y(0) = -2; \quad y'(0) = 1.$$

$$5) \begin{cases} 5x + 4y'' - 2y = 14\cos 6t \\ 2x'' + 3x - y'' + 3y = 30\cos 6t \end{cases}.$$

$$\begin{aligned} x(0) &= -1; & y(0) &= -1; \\ x'(0) &= 0; & y'(0) &= 0 \end{aligned}$$

18 вариант.

$$1) F(p) = \frac{p^2 + 8p + 15}{(p^2 + 8p + 17)^2}.$$

$$2) F(p) = \frac{p^2 + 2p + 4}{p^3 + p^2}.$$

$$3) 2y'' - y' + y = 2\sin t - 2\cos t;$$

$$y(0) = 2; \quad y'(0) = 0.$$

$$4) 3y'' - y' + 2y = 6t - 7;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$5) \begin{cases} 5x + 4y'' - 2y' = -147\operatorname{ch} 6t \\ 2x'' + 3x - y'' + 3y = -42\operatorname{ch} 6t \end{cases}.$$

$$\begin{aligned} x(0) &= -1; & y(0) &= -1; \\ x'(0) &= 0; & y'(0) &= 0 \end{aligned}$$

19 вариант.

$$1) F(p) = \frac{5p}{p^2 + 4p + 13}.$$

$$2) F(p) = \frac{1}{p^5 + p^3}.$$

$$3) 2y'' - y' + y = 3\text{sh}t - \text{cht};$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) y'' + 2y' + 3y = -\sin 2t + 4\cos 2t;$$

$$y(0) = 0; \quad y'(0) = 2.$$

$$5) \begin{cases} -4x'' + 9x + y' = 65\cos 2t \\ 6x'' + 7x + 3y' = -81\cos 2t \end{cases}.$$

$$\begin{aligned} x(0) &= 3; & y(0) &= 0; \\ x'(0) &= 0; & y'(0) &= -10 \end{aligned}$$

20 вариант.

$$1) F(p) = \frac{p}{p^4 - 20p^2 + 64}.$$

$$2) F(p) = \frac{p^2}{p^4 + 72p^2 + 1296}.$$

$$3) 2y'' - y' + y = -3\text{sh}t + 9\text{cht};$$

$$y(0) = 3; \quad y'(0) = 0.$$

$$4) y'' + 2y' + 3y = -8\sin 2t - 2\cos 2t;$$

$$y(0) = 2; \quad y'(0) = 0.$$

$$5) \begin{cases} -x'' - x' + 6x + 5y'' + 4y' - y = -5t + 8 \\ 3x'' - x' + 4x - 2y'' + 6y' + 2y = 10t + 22 \end{cases}.$$

$$\begin{aligned} x(0) &= -2; & y(0) &= 0; \\ x'(0) &= 0; & y'(0) &= 5 \end{aligned}$$

21 вариант.

$$1) F(p) = \frac{3}{p^3 - 9p}.$$

$$2) F(p) = \frac{p^2}{(p^2 + 16)}.$$

$$3) 2y'' - y' + y = -4e^t;$$

$$y(0) = -2; \quad y'(0) = -2.$$

$$4) y'' + 2y' + 3y = 7\text{sh}2t + 4\text{ch}2t;$$

$$y(0) = 0; \quad y'(0) = 2.$$

$$5) \begin{cases} -3x'' + 8x + 7y'' + y = 318\cos 3t \\ 5x'' + 6x - 4y'' = -222\cos 3t \end{cases}.$$

$$\begin{aligned} x(0) &= 2; & y(0) &= -4; \\ x'(0) &= 0; & y'(0) &= 0 \end{aligned}$$

22 вариант.

$$1) F(p) = \frac{16}{p^5 + 8p^3 + 16p}.$$

$$2) F(p) = \frac{p}{(p+1)(p^2 + 5p + 6)}.$$

$$3) 2y'' - y' + y = t - 12;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) y'' + 2y' + 3y = 12\operatorname{sh}2t + 21\operatorname{ch}2t;$$

$$y(0) = 3; \quad y'(0) = 0.$$

$$5) \begin{cases} -3x'' + 8x + 7y'' + y = -294\operatorname{ch}3t \\ 5x'' + 6x - 4y'' = 246\operatorname{ch}3t \end{cases}.$$

$$x(0) = 2; \quad y(0) = -4;$$

$$x'(0) = 0; \quad y'(0) = 0$$

23 вариант.

$$1) F(p) = \frac{16}{(p+5)(p+1)^2}.$$

$$2) F(p) = \frac{8p^2}{p^4 - 256}.$$

$$3) 2y'' - y' + y = -3\operatorname{sint} + \operatorname{cost};$$

$$y(0) = -2; \quad y'(0) = 1.$$

$$4) y'' + 2y' + 3y = -22e^{2t};$$

$$y(0) = -2; \quad y'(0) = -4.$$

$$5) \begin{cases} 5x + 4y'' - 2y = -147\operatorname{sh}6t \\ 2x'' + 3x - y'' + 3y = -42\operatorname{sh}6t \end{cases}.$$

$$x(0) = 0; \quad y(0) = 0;$$

$$x'(0) = -6; \quad y'(0) = -6.$$

24 вариант.

$$1) F(p) = \frac{5p^2 - 10p + 5}{p(p^2 + 2p + 1)}.$$

$$2) F(p) = \frac{16}{p^5 + 32p^3 + 256p}.$$

$$3) 3y'' - y' + y = 3t - 5;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$4) y'' + 2y' + 3y = 3t + 2;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -3x'' + 8x + 7y'' + y = 318\operatorname{sin}3t \\ 5x'' + 6x - 4y'' = -222\operatorname{sin}3t \end{cases}.$$

$$x(0) = 0; \quad y(0) = 0;$$

$$x'(0) = 6; \quad y'(0) = -12.$$

25 вариант.

1) $F(p) = \frac{81}{(p+10)(p+1)^2}$.

2) $F(p) = \frac{27}{p^4 - 81}$.

3) $2y'' + 3y' - y = -3\sin t + 3\cos t$;

$y(0) = 0$; $y'(0) = 1$.

4) $y'' + 2y' + 3y = 7\sin 2t + 6\cos 2t$;

$y(0) = -2$; $y'(0) = 2$.

5)
$$\begin{cases} -3x'' + x' + 8x + 7y'' + 2y' + y = -312e^{3t} \\ 5x'' + x' + 6x - 4y'' + 4y' = 204e^{3t} \end{cases}$$
.

$x(0) = 2$; $y(0) = -4$;

$x'(0) = 6$; $y'(0) = -12$.

26 вариант.

1) $F(p) = \frac{36}{(p+7)(p+1)^2}$.

2) $F(p) = \frac{16}{p^4 - 16}$.

3) $2y'' + 3y' - y = -6\sin t - 6\cos t$;

$y(0) = 2$; $y'(0) = 0$.

4) $y'' + 2y' + 3y = 9t$;

$y(0) = -2$; $y'(0) = 3$.

5)
$$\begin{cases} -x'' + 6x + 4y' = 40\sin 5t \\ 3x'' + 4x + 6y' = 60\sin 5t \end{cases}$$
.

$x(0) = 0$; $y(0) = -2$;

$x'(0) = 0$; $y'(0) = 0$.

27 вариант.

1) $F(p) = \frac{3p^2 - 6p + 3}{p(p^2 + 2p + 1)}$.

2) $F(p) = \frac{p^2 + 4p + 3}{(p^2 + 4p + 5)^2}$.

3) $2y'' + 3y' - y = \operatorname{sh} t + 3\operatorname{ch} t$;

$y(0) = 0$; $y'(0) = 1$.

4) $y'' - 3y' + 2y = 12\sin 2t - 4\cos 2t$;

$y(0) = 2$; $y'(0) = 0$.

5)
$$\begin{cases} -3x'' + 8x + 2y' = -62\operatorname{sh} 3t \\ 5x'' + 6x + 4y' = 54\operatorname{sh} 3t \end{cases}$$
.

$x(0) = 0$; $y(0) = -4$;

$x'(0) = 6$; $y'(0) = 0$.

28 вариант.

$$1) F(p) = \frac{1}{p^3 + 3p^2 + 2p}.$$

$$2) F(p) = \frac{p^2}{p^4 + 18p^2 + 81}.$$

$$3) y'' - 3y' + 2y = 6t - 13;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$4) 3y'' - 2y' + y = -6\text{sh}t + 12\text{ch}t;$$

$$y(0) = 3; \quad y'(0) = 0.$$

$$5) \begin{cases} -3x'' + 8x + 7y'' + y = -294\text{ch}3t \\ 5x'' + 6x - 4y'' = 246\text{ch}3t \end{cases}.$$

$$x(0) = 2; \quad y(0) = -4;$$

$$x'(0) = 0; \quad y'(0) = 0.$$

29 вариант.

$$1) F(p) = \frac{5p}{p^2 + 4p + 13}.$$

$$2) F(p) = \frac{10}{p^4 - 18p^2 + 81}.$$

$$3) y'' + 2y' + 3y = -4\text{sin}t + 4\text{cos}t;$$

$$y(0) = 2; \quad y'(0) = 0.$$

$$4) 3y'' - 2y' + y = t - 2;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$5) \begin{cases} -4x'' + 9x + y' = 65\text{cos}2t \\ 6x'' + 7x + 3y' = -81\text{cos}2t \end{cases}.$$

$$x(0) = 3; \quad y(0) = 0;$$

$$x'(0) = 0; \quad y'(0) = -10.$$

30 вариант.

$$1) F(p) = \frac{5p^2 - 20}{p^4 + 8p^2 + 16}.$$

$$2) F(p) = \frac{1}{p^3 + 7p^2 + 12p}.$$

$$3) y'' + 2y' + 3y = 4\text{sh}t + 2\text{ch}t;$$

$$y(0) = 0; \quad y'(0) = 1.$$

$$4) 2y'' + 3y' - y = -3t + 11;$$

$$y(0) = -2; \quad y'(0) = 3.$$

$$5) \begin{cases} -4x'' + 9x + 8y'' + 2y = 225\text{sin}2t \\ 6x'' + 7x - 5y'' - y = -146\text{sin}2t \end{cases}.$$

$$x(0) = 0; \quad y(0) = 0;$$

$$x'(0) = 6; \quad y'(0) = -10.$$