ДОМАШНЕЕ ЗАДАНИЕ ПО ОПЕРАЦИОННОМУ ИСЧИСЛЕНИЮ

Задача №1 Найти изображение оригинала $f(t)$.

Вариант №	$f(t)$	**Вариант №**	$f(t)$
1	$t\cdot e^{-3t}\cos 2t\cdot\sin 4t$	14	$\int\limits_0^t\left(\tau\cdot\operatorname{ch}^2 2t+\sin^2 4\tau\right)d\tau$
2	$\int\limits_0^t\frac{\cos 2\tau-\cos 6\tau}{\tau}$	15	$\int\limits_0^t\frac{\operatorname{ch}\tau-\operatorname{ch}4\tau}{\tau}d\tau$
3	$e^{-t}\cdot\int\limits_0^t(t-\tau)\cdot\sin^2\tau d\tau$	16	$e^{-2t}\cdot\int\limits_0^t(t-\tau)^3\cdot\cos^4 2\tau\cdot d\tau$
4	$t^2\cdot\operatorname{sh}2t+\operatorname{ch}t\cdot\cos 3t$	17	$\int\limits_0^t\frac{\sin 3\tau\cdot\sin 5\tau}{\tau}d\tau$
5	$(2t+1)e^{4t}\cdot\cos t\cdot\cos 3t$	18	$\left(t^2+2t\right)\cos 4t+\operatorname{sh}2t\cdot\sin t$
6	$\int\limits_0^t\frac{e^{-2\tau}\cdot\sin 3\tau}{\tau}d\tau$	19	$\int\limits_0^t\frac{e^{\tau}-\cos 4\tau}{\tau}d\tau$
7	$e^{2t}\cdot\sin^4 t+t\cdot\operatorname{ch}^2 t$	20	$\int\limits_0^t\frac{\operatorname{ch}3\tau-\operatorname{ch}\tau}{\tau}d\tau$
8	$t^2\operatorname{ch}4t+\operatorname{sh}2t\cdot\cos t$	21	$e^{-t}\cdot\operatorname{sh}3t\left(\sin^2 2t+2\right)$
9	$e^{-2t}\cdot\int\limits_0^t\sin^2(t-\tau)\cdot\operatorname{ch}\tau\cdot d\tau$	22	$e^t\cdot\frac{\sin 2t\cdot\sin 6t}{t}$
10	$\int\limits_0^t\frac{e^{2\tau}-\cos 3\tau}{\tau}d\tau$	23	$e^{-2t}(t\cdot\operatorname{ch}2t-\cos 2t)$
11	$t^2\cdot\sin 3t-\operatorname{ch}2t\cdot\sin 4t$	24	$\operatorname{ch}\frac{3t}{2}\cdot\left(\sin 2t\cdot t^2-4t^3\right)$
12	$e^{-3t}\cdot\int\limits_0^t\cos^2(t-\tau)\cdot\operatorname{sh}2\tau d\tau$	25	$\int\limits_0^t 2\cdot e^{\tau}\cdot\left(\tau\cdot\operatorname{ch}3\tau+\cos^2\tau\right)d\tau$
13	$(t+2)e^{-t}\cdot\sin 3t\cdot\sin 5t$	26	$e^{-2t}\cdot\frac{\sin 2t\cdot\cos 5t}{t}$

Задача 2. Найти изображение оригинала $f(t)$

Задача 3. Найти оригинал изображения $F(p)$.

№	**Задача 2**	**Задача 3**
1	$f(t)=\begin{cases}5, & 0<t<2\\ 5-2t, & 2<t<3\\ 6-3t, & t>3\end{cases}$	$F(p)=\dfrac{p^2-1}{(p^2+2p+3)(p^2+1)}$
2	$f(t)=\begin{cases}1-t, & 0<t<1\\ -t^2+4t-3, & 1<t<3\\ t-3, & t>3\end{cases}$	$F(p)=\dfrac{9p^3+16p^2+14p+1}{(p^2+2p+2)(p^2-1)}$
3	$f(t)=\begin{cases}t, & 0<t<1\\ t^2, & 1<t<2\\ 0, & t>2\end{cases}$	$F(p)=\dfrac{p+2}{p^3-1}$
4	$f(t)=\begin{cases}4t, & 0<t<2\\ t^3, & 2<t<3\\ 0, & t>3\end{cases}$	$F(p)=\dfrac{p-1}{p(p^2-4p+4)(p+3)}$
5	$f(t)=\begin{cases}-\dfrac{t}{2}, & 0<t<2\\ -(t-1)^2, & 2<t<3\\ -4, & t>3\end{cases}$	$F(p)=\dfrac{4p^3+5p^2+p-5}{(p^2+3p+4)(p+1)^2}$
6	$f(t)=\begin{cases}t^3, & 0<t<1\\ -\dfrac{1}{2}t+\dfrac{3}{2}, & 1<t<3\\ 0, & t>3\end{cases}$	$F(p)=\dfrac{p^2+2p-1}{p^3-2p^2+2p-1}$
7	$f(t)=\begin{cases}t^2-2t, & 0<t<3\\ -2t+9, & 3<t<5\\ -1, & t>5\end{cases}$	$F(p)=\dfrac{2p+3}{p^3+4p^2+5p}$

8	$f(t)=\begin{cases} t^2-2t, & 0<t<3 \\ 3, & 3<t<6 \\ 2t-9, & t>6 \end{cases}$	$F(p)=\dfrac{p-2}{(p^2+5p)(p^2-6p+9)}$
9	$f(t)=\begin{cases} 2t^2, & 0<t<1 \\ 2, & 1<t<4 \\ \frac{1}{2}(t-6)^2, & t>4 \end{cases}$	$F(p)=\dfrac{4p^2+2p-9}{p^3-3p^2-3p-4}$
10	$f(t)=\begin{cases} 3t, & 0<t<1 \\ 3, & 1<t<3 \\ 3(t-2)^2, & t>3 \end{cases}$	$F(p)=\dfrac{4p^3+10p^2+6p+36}{(p^2+p+4)(p^2-p-2)}$
11	$f(t)=\begin{cases} -\cos t+1, & 0<t<\frac{\pi}{3} \\ \frac{1}{2}, & \frac{\pi}{3}<t<4 \\ -2t+\frac{17}{2}, & t>4 \end{cases}$	$F(p)=\dfrac{p}{p^3+1}$
12	$f(t)=\begin{cases} 2t+1, & 0<t<1 \\ 3, & 1<t<2 \\ -t^2+2t+3, & t>2 \end{cases}$	$F(p)=\dfrac{2p^3-6p^2-7p-19}{(p^2+p+3)(p^2+p-2)}$
13	$f(t)=\begin{cases} \sin t, & 0<t<\frac{\pi}{6} \\ \frac{1}{2}, & \frac{\pi}{6}<t<1 \\ 2t-\frac{3}{2}, & t>1 \end{cases}$	$F(p)=\dfrac{p+4}{p^2(p^2+2p-3)}$
14	$f(t)=\begin{cases} -2t+1, & 0<t<2 \\ t^2-2t-3, & 2<t<4 \\ 5, & t>2 \end{cases}$	$F(p)=\dfrac{2p^3-6p^2+3p-7}{(p^2-p+1)(p^2-p-2)}$
15	$f(t)=\begin{cases} 1+4t, & 0<t<1 \\ -2t+7, & 1<t<5 \\ t-8, & t>5 \end{cases}$	$F(p)=\dfrac{5p^3+5p^2-11p+3}{p^3(p+3)}$

16	$f(t)=\begin{cases}\frac{t}{2}, & 0<t<2\\ -2t+5, & 2<t<3\\ t^2-2t-4, & t>3\end{cases}$	$F(p)=\dfrac{2p^3-4p^2+6p+1}{(p^2+2p+2)(p^2-2p+1)}$
17	$f(t)=\begin{cases}\sin t+2, & 0<t<\frac{\pi}{6}\\ \frac{5}{2}, & \frac{\pi}{6}<t<1\\ -3t+\frac{11}{2}, & t>1\end{cases}$	$F(p)=\dfrac{4p^3-11p^2+12p-8}{(p^2-2p+4)(p^2-p)}$
18	$f(t)=\begin{cases}2t-1, & 0<t<1\\ 1, & 1<t<2\\ t^3-7, & t>2\end{cases}$	$F(p)=\dfrac{2p^3+10p^2+24p+7}{(p^2-4p+5)(p^2+4p+4)}$
19	$f(t)=\begin{cases}\cos t-\frac{\sqrt{2}}{2}, & 0\le t<\frac{\pi}{4}\\ 0, & \frac{\pi}{4}\le t<2\\ 2t-4, & t\ge 2\end{cases}$	$F(p)=\dfrac{1}{(p-1)^3(p^3+1)}$
20	$f(t)=\begin{cases}(t-1)^2, & 0<t<2\\ \frac{t}{2}, & 2<t<6\\ -t+9, & t>6\end{cases}$	$F(p)=\dfrac{3p^3+3p+3}{(p^3-1)(p-1)}$
21	$f(t)=\begin{cases}2\cos t, & 0<t<\frac{\pi}{3}\\ 1, & \frac{\pi}{3}<t<2\\ 2t-3, & t>2\end{cases}$	$F(p)=\dfrac{5p^3+3p^2+12p-12}{p^4-16}$
22	$f(t)=\begin{cases}t^2-2, & 0<t<2\\ -t+4, & 2<t<6\\ 2t-14, & t>6\end{cases}$	$F(p)=\dfrac{2p^4-4p^3+3p^2+16p+16}{(p^2+4p+6)(p-1)^3}$

23	$f(t)=\begin{cases}\cos 2t-3, & 0<t<\frac{\pi}{6}\\ -\frac{5}{2}, & \frac{\pi}{6}<t<1\\ 3t-\frac{11}{2}, & t>1\end{cases}$	$F(p)=\frac{1}{p^4-6p^3+11p^2-6p}$
24	$f(t)=\begin{cases}-2t+4, & 0<t<1\\ 2, & 1<t<4\\ t^2-6t+10, & t>4\end{cases}$	$F(p)=\frac{6p^3+4p+1}{p^4+p^2}$
25	$f(t)=\begin{cases}2\sin 2t, & 0<t<\frac{\pi}{12}\\ 1, & \frac{\pi}{12}<t<2\\ -t^2+2t+1, & t>2\end{cases}$	$F(p)=\frac{p^2+p+4}{p^2(p+3)^3}$
26	$f(t)=\begin{cases}2t-3, & 0\le t<2;\\ e^t, & 2\le t<5;\\ t^2-3t+4, & t\ge 5.\end{cases}$	$F(p)=\frac{p^3+3p+2}{p^4+4}$
27	$f(t)=\begin{cases}t^2-3t, & 0\le t<1;\\ 2t+1, & 1\le t<3;\\ \cos(\pi t), & t\ge 3.\end{cases}$	$F(p)=\frac{p^2-p+4}{(p^2+4p+13)^2}$

Задача №4

Решить операционным методом задачу Коши для ДУ второго порядка:

1. $\ddot{x}+4\dot{x}+4x=t^2e^{-2t},\quad x(0)=1,\ \dot{x}(0)=2$.

2. $\ddot{x}+4x=2\cos^2 t,\quad x(0)=0,\ \dot{x}(0)=0$

3. $\ddot{x}+\dot{x}=t\cos t,\quad x(0)=1,\ \dot{x}(0)=0$

4. $4\ddot{x}+4\dot{x}+x=2e^{-\frac{t}{2}},\quad x(0)=1,\ \dot{x}(0)=1$

5. $\ddot{x}-12\dot{x}+36x=3e^{6t},\quad x(0)=-1,\ \dot{x}(0)=-2$

6. $4\ddot{x}-4x=\sin\frac{3t}{2}\cdot\sin\frac{t}{2},\quad x(0)=1,\ \dot{x}(0)=0$

7. $\dddot{x}+x=e^{t},\quad x(0)=0,\ \dot{x}(0)=2,\ \ddot{x}(0)=0$

8. $\ddot{x}+2\dot{x}+x=2\sin^2 t,\quad x(0)=0,\ \dot{x}(0)=-1$

9. $\ddot{x}-x=te^{t},\quad x(0)=1,\ \dot{x}(0)=0$

10. $\ddot{x}-4\dot{x}+4x=4\cos 2t,\quad x(0)=-1,\ \dot{x}(0)=3$

11. $4\ddot{x}-4\dot{x}+2x=5e^{\frac{t}{2}},\quad x(0)=5,\ \dot{x}(0)=3$

12. $\ddot{x}-6\dot{x}+10x=te^{3t},\quad x(0)=0,\ \dot{x}(0)=1$

13. $\ddot{x}+\dot{x}=4\sin^2 t,\quad x(0)=0,\ \dot{x}(0)=-1$

14. $\ddot{x}+2\dot{x}=te^{t}+4\sin t,\quad x(0)=-1,\ \dot{x}(0)=0$

15. $\ddot{x}-4\dot{x}+5x=2e^{2t}\sin t,\quad x(0)=3,\ \dot{x}(0)=5$

16. $\ddot{x}+x-12x=3\cos 2t,\quad x(0)=-1,\ \dot{x}(0)=3$

17. $\ddot{x}-5\dot{x}+6x=13\sin 2t,\quad x(0)=-1,\ \dot{x}(0)=-2$

18. $\ddot{x}-2\dot{x}+x=t-\sin t,\quad x(0)=1,\ \dot{x}(0)=2$

19. $\ddot{x}+x=t\cos 2t,\quad x(0)=0,\ \dot{x}(0)=-1$

20. $\ddot{x}+4x=2\cos t\cdot\cos 3t,\quad x(0)=0,\ \dot{x}(0)=2$

21. $\dddot{x}-8x=3t^2,\quad x(0)=0,\ \dot{x}(0)=1, \ddot{x}(0)=-1$

22. $\ddot{x}-10\dot{x}+25x=5\sin 5t,\quad x(0)=1,\ \dot{x}(0)=0$

23. $\ddot{x}+8\dot{x}+16x=6\cos 4t,\quad x(0)=-1,\ \dot{x}(0)=3$

24. $6\ddot{x}-\dot{x}-x=e^{\frac{t}{2}},\quad x(0)=-3,\ \dot{x}(0)=1$

25. $\ddot{x}-2\dot{x}+5x=3e^{t},\quad x(0)=-2,\ \dot{x}(0)=0$

26. $9\ddot{x}+x=e^{2t},\quad x(0)=1,\ \dot{x}(0)=-3$