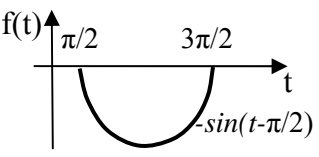
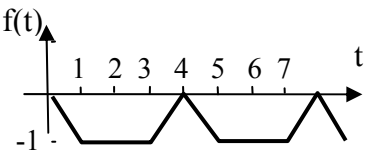


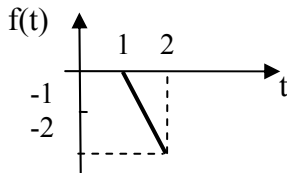
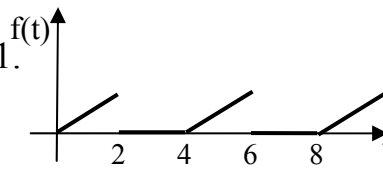
## Варианты индивидуальных заданий

### Вариант 6

Условие	Ответ
1. $f(t) = t^5 \cos t$	1. Да
2. $f(t) = ch^2 3t$	2. $F(p) = \frac{p^2 - 18}{p(p^2 - 36)}$
3. $f(t) = e^{-2t} \cos 2t + e^{-2t} \sin 2t$	3. $F(p) = \frac{p + 4}{(p + 2)^2 + 4}$
4. $f(t) = \int_0^t t^3 e^{-3t} dt$	4. $F(p) = \frac{3!}{p(p + 3)^4}$
5. $f(t) = \cos 4(t - 7)\eta(t - 7)$	5. $F(p) = \frac{pe^{-7p}}{p^2 + 16}$
6. $f(t) = \int_0^t (t - \tau)^3 ch 9\tau d\tau$	6. $F(p) = \frac{6}{p^3(p^2 - 81)}$
7. 	7. $F(p) = -\frac{1}{p^2 + 1} (e^{-\frac{\pi}{2}p} + e^{-\frac{3\pi}{2}p})$
8. $f(t) = (t^2 - 6t)\eta(t - 3)$	8. $F(p) = \left(\frac{2}{p^3} - \frac{9}{p}\right) \cdot e^{-3p}$
9. $f(t) = (t^2 e^{-t} ch^2 t)'$	9. $F(p) = p \left( \frac{1}{(p+1)^3} + \frac{1}{2(p-1)^3} + \frac{1}{2(p+3)^3} \right)$
10. $f(t) = e^{-t} \int_0^t L^{-1} \left\{ \frac{p}{p^2 + 9} \right\} dt$	10. $F(p) = \frac{1}{(p+1)^2 + 9}$
11. 	11. $F(p) = \frac{e^{-p} - 1 - e^{-4p} + e^{-3p}}{p^2(1 - e^{-4p})}$

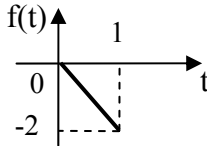
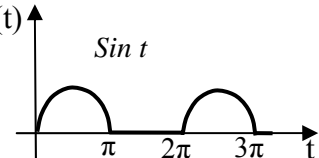
12. $f(t) = \int_0^t \frac{1-e^{2t}}{t} dt$	12. $F(p) = \frac{1}{p} \ln \frac{p-2}{p}$
13. $F(p) = \frac{p^2 - 1}{(p^2 + 1)(p - 4)}$	13. $f(t) = \frac{2}{17} \cos t + \frac{8}{17} \sin t + \frac{15}{17} e^{4t}$
14. $F(p) = \frac{3e^{-2p}}{(p-1)^3}$	14. $f(t) = \frac{3}{2} (t-2)^2 e^{t-2} \eta(t-2)$
15. $F(p) = \frac{15}{p^2 (p^2 + 2p - 15)}$	15. $f(t) = \frac{5}{24} e^{3t} - \frac{2}{15} - t - \frac{3}{40} e^{-5t}$
16. $y'' + 9y = f(t)$ , где $f(t) = \begin{cases} 0, & t \in [0;2), \\ -3, & t \in [2;3), \\ 0, & t \geq 3, \end{cases} \quad \begin{matrix} y(0) = 0 \\ y'(0) = 1 \end{matrix}$	16. $y(t) = -\frac{1}{3} \eta(t-2) - \frac{1}{3} \cos 3(t-2) \eta(t-2) + \frac{1}{3} \eta(t-3) - \frac{1}{3} \cos 3(t-3) \eta(t-3) + \frac{1}{3} \sin 3t$
17. $x'' - 10x' + 25x = -2e^{-5t}$ $x(0) = 0, \quad x'(0) = 1$	17. $x(t) = \frac{e^{5t}}{50} - \frac{e^{-5t}}{50} + \frac{4}{5} t e^{5t}$
18. $x'' + 16x = 4 \cos 4t$ $x(0) = 0 \quad x'(0) = 1$	18. $x(t) = \frac{1}{2} (t + \frac{1}{2}) \sin 4t$
19. $\begin{cases} x' - x - y = -e^t \\ y' - 2y - 2x = e^{4t} \end{cases}$ $x(0) = y(0) = 0$	19. $x(t) = \frac{3}{4} + \frac{e^{4t}}{4} - \frac{e^t}{2} - \frac{e^{3t}}{2}$ $y(t) = -\frac{3}{4} + \frac{3}{4} e^{4t} + e^t - e^{3t}$
20. $x'' + 3x' = \frac{1}{1+e^{3t}}$ $x(0) = x'(0) = 0$	20. $x(t) = \frac{t}{3} - \frac{1}{9} (1+e^{-3t}) \ln \frac{1+e^{3t}}{2}$

Вариант 7

УСЛОВИЕ	ОТВЕТ
1. $f(t) = e^{t^5}$	1. Нет
2. $f(t) = sh^2 5t$	2. $F(p) = \frac{50}{p(p^2 - 100)}$
3. $f(t) = e^{-2t} sh 2t - e^{-2t} ch 2t$	3. $F(p) = -\frac{p}{(p+2)^2 - 4}$
4. $f(t) = \int_0^t t \sin t dt$	4. $F(p) = \frac{2}{(p^2 + 1)^2}$
5. $f(t) = \sin 4(t-7)\eta(t-7)$	5. $F(p) = \frac{4}{p^2 + 16} e^{-7p}$
6. $f(t) = \int_0^t e^{3(t-\tau)} \tau^2 d\tau$	6. $F(p) = \frac{2}{p^3(p-3)}$
7. 	7. $F(p) = \frac{2e^{-p}}{p^2} ((1+p)e^{-p} - 1)$
8. $f(t) = (t^2 - 16)\eta(t-4)$	8. $F(p) = \left(\frac{2}{p^3} + \frac{8}{p^2}\right) e^{-4p}$
9. $f(t) = (\cos(t-3) + 1) \times e^{-(t-3)} \eta(t-3)$	9. $F(p) = \frac{(p+1)e^{-3p}}{(p+1)^2 + 1} + \frac{e^{-3p}}{p+1}$
10. $f(t) = (t(\cos 2t - \sin t))'$	10. $F(p) = p \left( \frac{p^2 - 4}{(p^2 + 4)^2} - \frac{2p}{(p^2 + 1)^2} \right)$
11. 	11. $F(p) = \frac{1 - e^{-2p} - 2pe^{-2p}}{2p^2(1 - e^{-4p})}$

12. $f(t) = \int_0^t \frac{\sin mt \cdot \cos nt}{t} d\tau$	12. $F(p) = \frac{1}{2p} (\pi - \operatorname{arctg} \frac{p}{m+n} - \operatorname{arctg} \frac{p}{m-n})$
13. $F(p) = \frac{p^2}{(p+3)(p^2+4)}$	13. $f(t) = \frac{9}{13} e^{-3t} + \frac{4}{13} \cos 2t - \frac{6}{13} \sin 2t$
14. $F(p) = \frac{3e^{-2p}}{(p-1)^3}$	14. $f(t) = \frac{3}{2} (t-2)^2 e^{(t-2)} \eta(t-2)$
15. $F(p) = \frac{-3}{p^2(p^2+8p+15)}$	15. $f(t) = \frac{8}{75} - \frac{1}{5}t - \frac{1}{6}e^{-3t} + \frac{3}{50}e^{-5t}$
16. $y'' + 4y' + 4y = f(t)$ , где $f(t) = \begin{cases} 1, & 0 \leq t \leq 1 \\ 0, & 1 < t \leq 2, \\ 1, & 2 < t \leq 3 \\ 0, & t > 3, \end{cases}$ $y(0) = 0, y'(0) = 0$	$y(t) = \frac{1}{4}(1 - e^{-2t} - 2te^{-2t}) -$ 16. $-\frac{1}{4}\eta(t-1)(1 - e^{-2(t-1)} - 2(t-1)e^{-2(t-1)}) +$ $+\frac{1}{4}\eta(t-2)(1 - e^{-2(t-2)} - 2(t-2)\eta(t-2)) -$ $-\frac{1}{4}\eta(t-3)(1 - e^{-2(t-3)} - 2(t-3)e^{-2(t-3)})$
17. $x'' - 8x' + 16x = -3e^{-2t}$ , $x(0) = 0, x'(0) = 1$	17. $x(t) = \frac{1}{12}e^{4t} + \frac{1}{2}te^{4t} - \frac{1}{12}e^{-2t}$
18. $x'' + \frac{1}{16}x = 3 \cos \frac{t}{4}$ , $x(0) = 0, x'(0) = -5$	18. $x(t) = (6t - 20) \sin \frac{t}{4}$
19. $\begin{cases} x' + x + y = 2e^{2t} \\ y' + 2y + 2x = 2e^{3t} \end{cases}$ $x(0) = 0, y(0) = 0$	19. $x(t) = -\frac{4}{9} - \frac{e^{3t}}{9} + \frac{4}{5}e^{2t} - \frac{11}{45}e^{-3t},$ $y(t) = \frac{4}{9} + \frac{4}{9}e^{3t} - \frac{2}{5}e^{2t} - \frac{22}{45}e^{-3t}$
20. $x''' = \frac{1}{1+t^2}$ , $x(0) = x'(0) = x''(0) = 0$	20. $x(t) = \frac{t}{2} - \frac{t}{2} \ln(1+t^2) + \frac{t^2-1}{2} \cdot \operatorname{arctgt}$

Вариант 8

УСЛОВИЕ	ОТВЕТ
1. $f(t) = \frac{1}{t^2 - 1}$	1. Нет
2. $f(t) = 3(t-1)^2$	2. $F(p) = \frac{6}{p^3} (1 - p + \frac{1}{2} p^2)$
3. $f(t) = e^{-2t} \operatorname{sh} t + e^{-2t} \operatorname{ch} t$	3. $F(p) = \frac{p+3}{(p+2)^2 - 1}$
4. $f(t) = \int_0^t t e^{2t} dt$	4. $F(p) = \frac{1}{p(p-2)^2}$
5. $f(t) = \sin 3(t-5) \eta(t-5)$	5. $F(p) = \frac{3e^{-5p}}{p^2 + 9}$
6. $f(t) = \int_0^t e^{5\tau} (t-\tau)^3 d\tau$	6. $F(p) = \frac{3!}{p^4 (p-5)}$
7. 	7. $F(p) = \frac{1}{p^2} (e^{-p} + p e^{-p} - 1)$
8. $f(t) = (t^2 + 50) \eta(t-5)$	8. $F(p) = \frac{e^{-5p}}{p^3} (2 + 10p + 75p^2)$
9. $f(t) = \operatorname{sh}^2(t-4) e^{-(t-4)} \eta(t-4)$	9. $F(p) = \frac{(p+1)e^{-4p}}{2((p+1)^2 - 4)} - \frac{e^{-4p}}{2(p+1)}$
10. $f(t) = \int_0^t \frac{\sin^2 t}{t} dt$	10. $F(p) = \frac{1}{2p} \ln \frac{\sqrt{p^2 + 4}}{p}$
11. 	11. $F(p) = \frac{1 + e^{-\pi p}}{(p^2 + 1)(1 - e^{-2\pi p})}$

12. $f(t) = (t^2 e^{-t} \operatorname{ch}^2 t)'$	12. $F(p) = p\left(\frac{1}{(p+1)^3} + \frac{1}{2(p-1)^3} + \frac{1}{2(p+3)^3}\right)$
13. $F(p) = \frac{2p+1}{(p-6)(p^2+16)}$	13. $f(t) = \frac{1}{4}e^{6t} - \frac{1}{4}\cos 4t + \frac{7}{8}\sin 4t$
14. $F(p) = \frac{d}{dp}\left(\frac{3(p+1)}{(p+1)^2+9}\right)$	14. $f(t) = -3te^{-t} \cos 3t$
15. $F(p) = \frac{10}{p^2(p^2+3p-4)}$	15. $f(t) = -\frac{15}{8} - \frac{5}{2}t + 2e^t - \frac{1}{8}e^{-4t}$
16. $y'' + 3y' + 2y = f(t)$ , где $f(t) = \begin{cases} t, & 0 \leq t \leq 1 \\ 0, & t > 1, \end{cases}$ $y(0) = y'(0) = 0$	16. $y(t) = -\frac{3}{4} + \frac{1}{2}t + e^{-t} - \frac{1}{4}e^{-2t} + \left(\frac{1}{4} - \frac{1}{2}(t-1) - \frac{1}{4}e^{-2(t-1)}\right)\eta(t-1)$
17. $x'' - 4x' + 4x = 7e^{3t}$ $x(0) = 0, \quad x'(0) = 4$	17. $x(t) = -(3t+7)e^{2t} + 7e^{3t}$
18. $x'' + \frac{1}{4}x = 2\cos \frac{t}{2}$ $x(0) = 0 \quad x'(0) = 5$	18. $x(t) = 2(t+5)\sin \frac{t}{2}$
19. $\begin{cases} x' - 2x - 2y = 2e^{2t} \\ y' - x - y = e^{2t} \end{cases}$ $x(0) = y(0) = 0$	19. $x(t) = -2e^{2t} + 2e^{3t}$ $y(t) = -e^{2t} + e^{3t}$
20. $x'' = \operatorname{arctg} t$ $x(0) = x'(0) = 0$	20. $x(t) = \frac{t^2}{2}\operatorname{arctg} t - \frac{1}{2}t \ln(1+t^2) + \frac{t}{2} - \frac{1}{2}\operatorname{arctg} t$

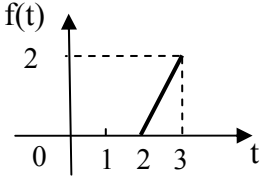
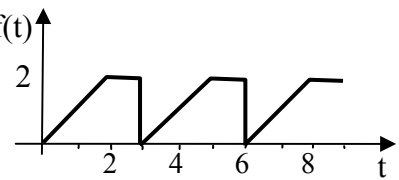
Вариант 9

УСЛОВИЕ	ОТВЕТ
1. $f(t) = t^2 e^{-t}$	1. Да
2. $f(t) = t^2 + 2t$	2. $F(p) = \frac{2(p+1)}{p^3}$
3. $f(t) = e^t \operatorname{sh} 2t - 2e^t \operatorname{ch} 2t$	3. $F(p) = \frac{2(1-p)}{(p-1)^2 - 4}$
4. $f(t) = \int_0^t t \sin 3t dt$	4. $F(p) = \frac{6}{(p^2 + 9)^2}$
5. $f(t) = \operatorname{sh} 2(t-3)\eta(t-3)$	5. $F(p) = \frac{2e^{-3p}}{p^2 - 4}$
6. $f(t) = \int_0^t e^{7(t-\tau)} \tau^4 d\tau$	6. $F(p) = \frac{4!}{p^5 (p-7)}$
7.	7. $F(p) = \frac{2e^{-2p}}{p^2} (pe^{-p} + e^{-p} - 1)$
8. $f(t) = (t^2 - 7t)\eta(t-7)$	8. $F(p) = \frac{2e^{-7p}}{p^3} + \frac{7e^{-7p}}{p^2}$
9. $f(t) = (2(t-3) + \operatorname{ch}(t-3)) \times e^{t-3} \eta(t-3)$	9. $F(p) = \frac{2e^{-3p}}{(p-1)^2} + \frac{(p-1)e^{-3p}}{(p-1)^2 - 1}$
10. $f(t) = \frac{\int_0^t (t - \cos t) dt}{t}$	10. $F(p) = \frac{1}{2p^2} + \operatorname{arctg} p - \frac{\pi}{2}$
11.	11. $F(p) = \frac{e^{-4p} - e^{-2p} + 2pe^{-2p}}{p^2(1 - e^{-4p})}$

12. $f(t) = (t^2(1 + \sin t))'$	12. $F(p) = \frac{2!}{p^2} + \frac{6p^3 - 2p}{(p^2 + 1)^3}$
13. $F(p) = \frac{p+3}{(p^2+1)(p+5)}$	13. $f(t) = -\frac{1}{13}e^{-5t} + \frac{1}{13}\cos t + \frac{8}{13}\sin t$
14. $F(p) = \frac{d}{dp} \left( \frac{4(p-3)}{(p-3)^2 + 4} \right)$	14. $f(t) = -4te^{3t} \cos 2t$
15. $F(p) = \frac{-4}{p^2(p^2 - 6p + 8)}$	15. $f(t) = -\frac{3}{8} - \frac{1}{2}t + \frac{1}{2}e^{2t} - \frac{1}{8}e^{4t}$
16. $y'' + 5y' + 6y = f(t)$ , где $f(t) = \begin{cases} -1, & 0 \leq t \leq 1 \\ -2, & 1 < t \leq 2, \\ 0, & t > 2, \end{cases}$ $y(0) = y'(0) = 0$	16. $y(t) = -\frac{1}{6} + \frac{1}{2}e^{-2t} - \frac{1}{3}e^{-3t} - \frac{1}{6}\eta(t-1) +$ $+\frac{1}{2}e^{-2(t-1)}\eta(t-1) - \frac{1}{3}e^{-3(t-1)}\eta(t-1) +$ $+\frac{1}{3}\eta(t-2) - e^{-2(t-2)}\eta(t-2) +$ $+\frac{2}{3}e^{-3(t-2)}\eta(t-2)$
17. $x'' - 6x' + 9x = 6e^t$ $x(0) = 0, \quad x'(0) = -4$	17. $x(t) = \frac{3}{2}e^t - e^{3t}(t + \frac{3}{2})$
18. $x'' + 49x = 7 \cos 7t$ $x(0) = 0 \quad x'(0) = 2$	18. $x(t) = (\frac{t}{2} + \frac{2}{7}) \sin 7t$
19. $\begin{cases} x' - 2x - 2y = 2e^{2t} \\ y' + x + y = e^{3t} \end{cases}$ $x(0) = y(0) = 0$	19. $x(t) = \frac{5}{3} + \frac{e^{3t}}{3} + 3e^{2t} - 5e^t$ $y(t) = -\frac{5}{3} + \frac{e^{3t}}{6} - e^{2t} + \frac{5}{2}e^t$
20. $x'' = t \ln^2 t$ $x(0) = x'(0) = 0$	20. $x(t) = \frac{t^3}{6} \ln^2 t - \frac{5}{18}t^3 \ln t + \frac{19}{108}t^3$



Вариант 10

УСЛОВИЕ	ОТВЕТ
1. $f(t) = \frac{\sin t}{t-2}$	1. Нет
2. $f(t) = \sin^2 t$	2. $F(p) = \frac{2}{p(p^2 + 4)}$
3. $f(t) = e^{-t} \operatorname{sh} 2t + 2e^{-t} \operatorname{ch} 2t$	3. $F(p) = \frac{2p + 4}{(p + 1)^2 - 4}$
4. $f(t) = \int_0^t t \sin 4t dt$	4. $F(p) = \frac{8}{(p^2 + 16)^2}$
5. $f(t) = \operatorname{ch} 5(t-3) \eta(t-3)$	5. $F(p) = \frac{p e^{-3p}}{p^2 - 25}$
6. $f(t) = \int_0^t e^{9(t-\tau)} \tau^3 d\tau$	6. $F(p) = \frac{3!}{p^4 (p-9)}$
7. 	7. $F(p) = \frac{2e^{-2p}}{p^2} (1 - e^{-p} - pe^{-p})$
8. $f(t) = (t^2 - 5t + 1) \eta(t-6)$	8. $F(p) = \frac{e^{-6p}}{p^3} (2 + 7p + 7p^2)$
9. $f(t) = [\sin(2t-2) + \cos(t-1)] \times e^{t-1} \eta(t-1)$	9. $F(p) = \frac{2e^{-p}}{(p-1)^2 + 4} + \frac{(p-1)e^{-p}}{(p-1)^2 + 1}$
10. $f(t) = \int_0^t \frac{\sin^2 t}{t} dt$	10. $F(p) = \frac{1}{2p} \ln \frac{\sqrt{p^2 + 4}}{p}$
11. 	11. $F(p) = \frac{1 - e^{-2p} - 2pe^{-3p}}{p^2(1 - e^{-3p})}$

12. $f(t) = (t(\operatorname{ch}2t + \operatorname{sh}2t))'$	12. $F(p) = \frac{p(p+2)^2}{(p^2-4)^2}$
13. $F(p) = \frac{2p+3}{(p^2+9)(p-1)}$	13. $f(t) = \frac{1}{2}e^t - \frac{1}{2}\cos 3t + \frac{1}{2}\sin 3t$
14. $F(p) = \frac{d}{dp} \left( \frac{5(p+3)}{(p+3)^2+1} \right)$	14. $f(t) = -5te^{-3t} \operatorname{cost}$
15. $F(p) = \frac{8e^{-8p}}{(p+6)(p+8)^2}$	15. $f(t) = 2(e^{-6(t-8)} - e^{-8(t-8)} - 2(t-8)e^{-8(t-8)})\eta(t-8)$
16. $y'' + 16y = f(t)$ , где $f(t) = \begin{cases} 2, & 0 \leq t \leq 2 \\ -2, & 2 < t \leq 3, \\ 0, & t > 3, \end{cases}$ $y(0) = y'(0) = 0$	16. $y(t) = \frac{1}{8} - \frac{1}{8}\cos 4t - \frac{1}{4}\eta(t-2) + \frac{1}{4}\cos 4(t-2)\eta(t-2) + \frac{1}{8}\eta(t-3) - \frac{1}{8}\cos 4(t-3)\eta(t-3)$
17. $x'' + 10x' + 25x = e^{4t}$ $x(0) = 0, \quad x'(0) = 3$	17. $x(t) = 3te^{-5t} - \frac{1+9t}{81}e^{-5t} + \frac{e^{4t}}{81}$
18. $x'' + \frac{1}{6}x = 6\cos \frac{t}{4}$ $x(0) = 0 \quad x'(0) = -1$	18. $x(t) = (12t - 4)\sin \frac{t}{4}$
19. $\begin{cases} x' + x + y = 2e^{-2t} \\ y' - 3x - 3y = e^t \end{cases}$ $x(0) = y(0) = 0$	19. $x(t) = 1 + e^t - \frac{5}{4}e^{-2t} - \frac{3}{4}e^{2t}$ $y(t) = -1 - 2e^t + \frac{3}{4}e^{-2t} + \frac{9}{4}e^{2t}$
20. $x'' = \ln(1+t^2)$ $x(0) = x'(0) = 0$	20. $x(t) = \frac{t^2}{2}\ln(1+t^2) - \frac{3}{2}t^2 - \frac{1}{2}\ln(1+t^2) + 2t \operatorname{arctg} t$