$$f(t)=\frac{3}{8}t^2-\frac{1}{3}t+\frac{2}{7}t^3-\frac{1}{3}t\cdot e^{-2t}+t^4e^{3t}-\frac{1}{2}t\cdot\sin\frac{1}{2}t+\frac{1}{3}e^{3t}\cdot\cos 2t$$

$f(t)$ – оригинал $\quad \mathcal{L}(s)$ – изображение

$$\frac{3}{8}t^2 \xrightarrow{\mathcal{L}} \frac{3}{8}\cdot\frac{2}{s^3}$$

$$-\frac{1}{3}t \xrightarrow{\mathcal{L}} -\frac{1}{3}\cdot\frac{1}{s^2}$$

$$\frac{2}{7}t^3 \xrightarrow{\mathcal{L}} \frac{2}{7}\cdot\frac{6}{s^4}$$

$$-\frac{1}{3}te^{-2t} \longrightarrow -\frac{1}{3}\cdot\frac{1}{(s+2)^2}$$

$$t^4\cdot e^{3t} \longrightarrow \frac{4!}{(s-3)^5}$$

$$-\frac{1}{2}\underbrace{t\sin\frac{1}{2}t}\xrightarrow{\mathcal{L}} -\frac{1}{2}\cdot\frac{2\cdot\frac{1}{2}\cdot s}{\left(s^2+\left(\frac{1}{2}\right)^2\right)^2}$$

$$\frac{1}{3}\underbrace{e^{\overset{-a}{3t}}\cdot\overset{b}{\cos 2t}} \longrightarrow \frac{1}{3}\cdot\frac{s-3}{(s-3)^2+2^2}$$

$$\mathcal{L}(s)=\frac{3}{4s^3}-\frac{1}{3s^2}+\frac{12}{7s^4}-\frac{1}{3(s+2)^2}+\frac{24}{(s-3)^5}-\frac{s}{2\left(s^2+\frac{1}{4}\right)^2}+\frac{s-3}{3\left((s-3)^2+4\right)}$$

Задача 2

$$F(s) = \frac{7s}{49s^2+1} + \frac{1}{4(9s^2+1)} - \frac{4s^2-1}{2(4s^2+1)^2} \qquad f(t) - ?$$

$$\frac{7s}{49s^2+1} = \frac{7}{49}\cdot\frac{s}{s^2+\frac{1}{49}} = \frac{1}{7}\cdot\frac{s}{s^2+\left(\frac{1}{7}\right)^2} \longrightarrow \frac{1}{7}\cdot\cos\frac{1}{7}t$$

$$f(t) = \frac{1}{7}\cos\frac{1}{7}t + \frac{1}{12}\sin\frac{1}{3}t - \frac{1}{8}t\cos\frac{1}{2}t$$

$$\cos bt \longrightarrow \frac{s}{s^2+b^2}$$

$$\frac{1}{4(9s^2+1)} = \frac{1}{36}\cdot\frac{1}{s^2+\frac{1}{9}} = \frac{3}{36}\cdot\frac{\frac{1}{3}}{s^2+\left(\frac{1}{3}\right)^2} \Longrightarrow \frac{1}{12}\cdot\sin\frac{1}{3}t$$

$$\frac{b}{s^2+b^2} \longrightarrow \sin bt$$

$$\frac{4s^2-1}{2(4s^2+1)^2} = \frac{4}{2\cdot 16}\cdot\frac{s^2-\frac{1}{4}}{\left(s^2+\frac{1}{4}\right)^2} = \frac{1}{8}\cdot\frac{s^2-\left(\frac{1}{2}\right)^2}{\left(s^2+\left(\frac{1}{2}\right)^2\right)^2} \longrightarrow \frac{1}{8}t\cdot\cos\frac{1}{2}t$$

Function, $f(t)$	Laplace transform, $F(s)$	Function, $f(t)$	Laplace transform, $F(s)$
1	$\frac{1}{s}$	$e^{-at}\cos bt$	$\frac{s+a}{(s+a)^2+b^2}$
t	$\frac{1}{s^2}$	$\sinh bt$	$\frac{b}{s^2-b^2}$
t^2	$\frac{2}{s^3}$	$\cosh bt$	$\frac{s}{s^2-b^2}$
t^n	$\frac{n!}{s^{n+1}}$	$e^{-at}\sinh bt$	$\frac{b}{(s+a)^2-b^2}$
e^{at}	$\frac{1}{s-a}$	$e^{-at}\cosh bt$	$\frac{s+a}{(s+a)^2-b^2}$
e^{-at}	$\frac{1}{s+a}$	$t\sin bt$	$\frac{2bs}{(s^2+b^2)^2}$
$t^n e^{-at}$	$\frac{n!}{(s+a)^{n+1}}$	$t\cos bt$	$\frac{s^2-b^2}{(s^2+b^2)^2}$
$\sin bt$	$\frac{b}{s^2+b^2}$	$u(t)$ unit step	$\frac{1}{s}$
$\cos bt$	$\frac{s}{s^2+b^2}$	$u(t-d)$	$\frac{e^{-sd}}{s}$
$e^{-at}\sin bt$	$\frac{b}{(s+a)^2+b^2}$	$\delta(t)$	1
		$\delta(t-d)$	e^{-sd}

$$\boxed{s\cdot \overset{\text{ПЛ}}{\mathcal{L}(s)} = F(0) + \overset{\text{ПЛС}}{\mathcal{L}(s)}}$$

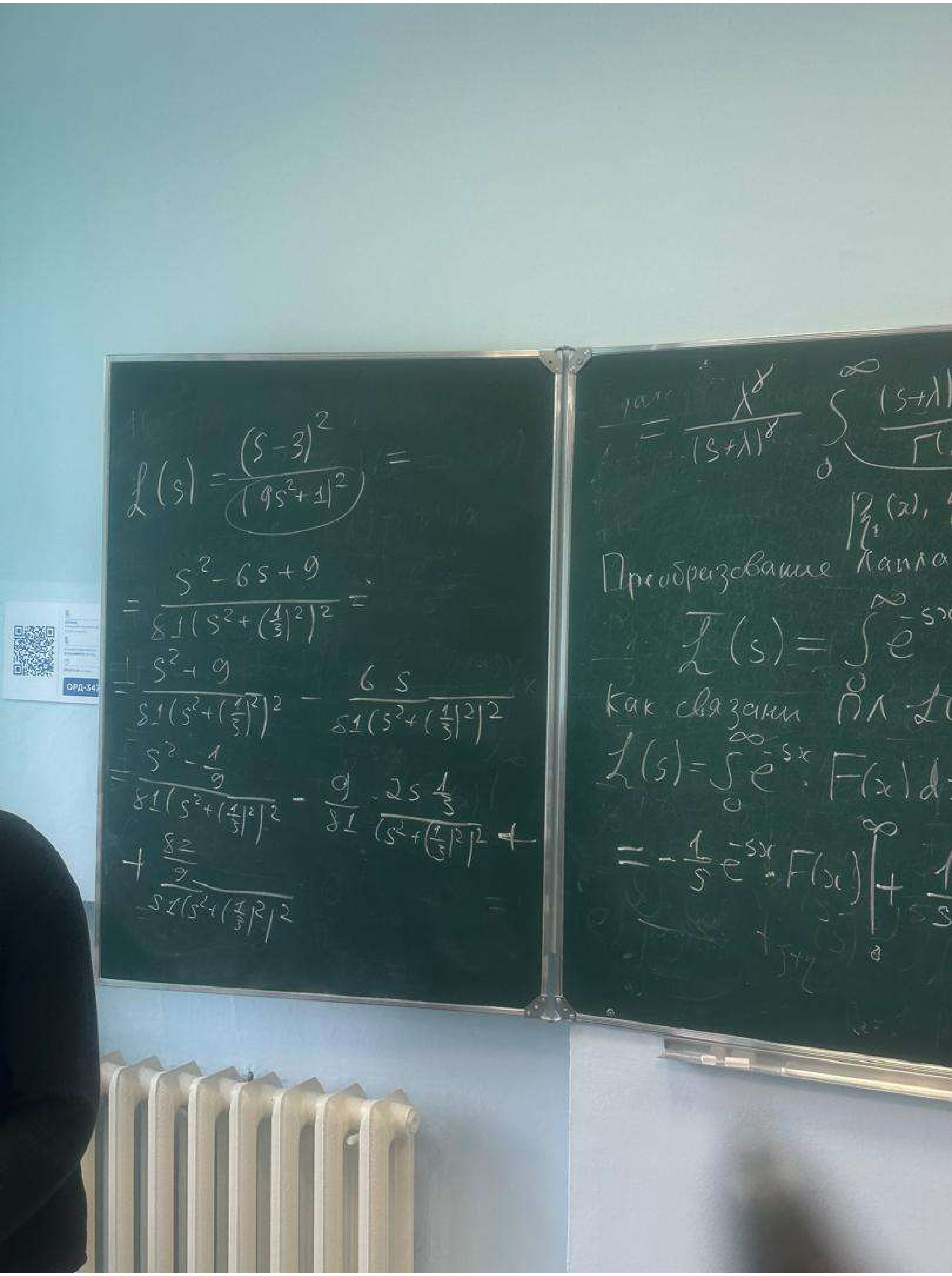
Задача 3

$$\mathcal{L}(s) = \frac{9s}{(4s+1)^2+4} = \frac{9s}{16(s+\frac{1}{4})^2+4} =$$

$$= \frac{9}{16}\cdot\frac{s+\frac{1}{4}-\frac{1}{4}}{(s+\frac{1}{4})^2+\frac{1}{4}} = \frac{9}{16}\left(\frac{s+\frac{1}{4}}{(s+\frac{1}{4})^2+(\frac{1}{2})^2} - \frac{\frac{1}{2}\cdot\frac{1}{2}}{(s+\frac{1}{4})^2+(\frac{1}{2})^2}\right)$$

$$e^{-\frac{1}{4}t}\cdot\cos\frac{1}{2}t \qquad \frac{1}{2}e^{-\frac{1}{4}t}\cdot\sin\frac{1}{2}t$$

$$= f(t) = \frac{9}{16}\left(e^{-\frac{1}{4}t}\cdot\cos\frac{1}{2}t - \frac{1}{2}e^{-\frac{1}{4}t}\cdot\sin\frac{1}{2}t\right)$$



$\mathcal{L}(s) = \frac{(s-3)^2}{(9s^2+1)^2} =$
$= \frac{s^2-6s+9}{81(s^2+(\frac{1}{3})^2)^2} =$
$= \frac{s^2+9}{81(s^2+(\frac{1}{3})^2)^2} - \frac{6s}{81(s^2+(\frac{1}{3})^2)^2}$
$= \frac{s^2-\frac{1}{9}}{81(s^2+(\frac{1}{3})^2)^2} - \frac{9}{81}\cdot\frac{2s\frac{1}{3}}{(s^2+(\frac{1}{3})^2)^2} +$
$+ \frac{\frac{82}{9}}{81(s^2+(\frac{1}{3})^2)^2}$
$= \frac{\lambda^\gamma}{(s+\lambda)^\gamma} \int_0^\infty$
Преобразование Лапла
$\mathcal{L}(s) = \int_0^\infty e^{-sx}$
как связаны ПЛ
$\mathcal{L}(s) = \int_0^\infty e^{-sx} \cdot F(x) d$
$= -\frac{1}{s} e^{-sx} \cdot F(x) \Big|_0^\infty +$