```
#Лабораторная работа 4
#Вариант 9
#Згирской Дарьи, гр. 353502

restart;

#Задание 1
```

$$f := t \to piecewise\left(t < 0, 0, 0 < t < a, \frac{t}{a} - 1, a < t < 2\cdot a, 0, \frac{t}{2\cdot a} - 1\right);$$

$$f := t \mapsto \begin{cases} 0 & t < 0 \\ \frac{t}{a} - 1 & 0 < t < a \\ 0 & a < t < 2\cdot a \\ \frac{t}{2\cdot a} - 1 & otherwise \end{cases} \tag{1}$$

$$f := \frac{1}{a}\cdot t\cdot \text{Heaviside}(t) - \text{Heaviside}(t) - \frac{1}{a}\cdot (t-a)\cdot \text{Heaviside}(t-a) + \frac{1}{2\cdot a}\cdot (t-2\cdot a)\cdot \text{Heaviside}(t-2\cdot a);$$

$$f := \frac{t\,\text{Heaviside}(t)}{a} - \text{Heaviside}(t) - \frac{(t-a)\,\text{Heaviside}(t-a)}{a} + \frac{(t-2\,a)\,\text{Heaviside}(t-2\,a)}{2\,a} \tag{2}$$

```
a := 3 : #Для примера
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$$F := inttrans[laplace](f, t, p);$$

$$F := -\frac{1}{p} + \frac{2 + e^{-6p} - 2\,e^{-3p}}{6\,p^2} \tag{3}$$

```
restart;

#Задание 2
```

$$F := \frac{2\cdot p + 1}{(p+1)\cdot\left(p^2 + 2\cdot p + 3\right)};$$

$$F := \frac{2\,p + 1}{(p+1)\,\left(p^2 + 2\,p + 3\right)} \tag{4}$$

$$f := inttrans[invlaplace](F, p, t);$$

$$f := \frac{e^{-t}\left(-1 + \cos\left(\sqrt{2}\,t\right) + 2\sqrt{2}\,\sin\left(\sqrt{2}\,t\right)\right)}{2} \tag{5}$$

```
restart;

#Задание 3
deq := diff(y(t), t, t) - diff(y(t), t) = exp(2 * t) / (2 + exp(t));
```

$$deq := \frac{d^2}{dt^2} y(t) - \frac{d}{dt} y(t) = \frac{e^{2t}}{2 + e^t} \quad (6)$$

```
> common_sol := dsolve(deq, y(t));
```

$$common\_sol := y(t) = e^t \_C1 + 2 \_C1 + (2 + e^t) \ln(2 + e^t) - 2 - e^t + \_C2 \quad (7)$$

```
> start_conditions := y(0) = 0, D(y)(0) = 0 :
> koshi_sol := dsolve({deq, start_conditions}, y(t));
```

$$koshi\_sol := y(t) = -e^t \ln(3) - 2\ln(3) + (2 + e^t) \ln(2 + e^t) + 1 - e^t \quad (8)$$

```
> restart;
>
> #Задание 4
> deq := diff(y(t), t, t) + diff(y(t), t) - 2·y(t) = exp(-t);
```

$$deq := \frac{d^2}{dt^2} y(t) + \frac{d}{dt} y(t) - 2\,y(t) = e^{-t} \quad (9)$$

```
> common_sol := dsolve(deq, y(t));
```

$$common\_sol := y(t) = e^{-2t} \_C2 + e^t \_C1 - \frac{e^{-t}}{2} \quad (10)$$

```
> start_conditions := y(0) = -1, D(y)(0) = 0 :
> koshi_sol := dsolve({deq, start_conditions}, y(t));
```

$$koshi\_sol := y(t) = -\frac{e^t}{2} - \frac{e^{-t}}{2} \quad (11)$$

```
> restart;
>
> #Задание 5
> sys := {diff(x(t), t) = -2·x(t) + 6·y(t) + 1, diff(y(t), t) = 2·x(t) + 2·y(t)};
```

$$sys := \left\{ \frac{d}{dt} x(t) = -2\,x(t) + 6\,y(t) + 1,\ \frac{d}{dt} y(t) = 2\,x(t) + 2\,y(t) \right\} \quad (12)$$

```
> common_sol := dsolve(sys);
```

$$common\_sol := \left\{ x(t) = e^{-4t} \_C2 + e^{4t} \_C1 + \frac{1}{8},\ y(t) = -\frac{e^{-4t} \_C2}{3} + e^{4t} \_C1 - \frac{1}{8} \right\} \quad (13)$$

```
> start_conditions := { x(0) = 0, y(0) = 1 } :
> koshi_sol := dsolve(sys union start_conditions);
```

$$koshi\_sol := \left\{ x(t) = -\frac{15\,e^{-4t}}{16} + \frac{13\,e^{4t}}{16} + \frac{1}{8},\ y(t) = \frac{5\,e^{-4t}}{16} + \frac{13\,e^{4t}}{16} - \frac{1}{8} \right\} \quad (14)$$

```
> restart;
```