Лабораторная работа № 6

```
> restart;
```

1

```
> one:=diff(y(x),x)=x*y(x);
```

$$one := \frac{d}{dx} y(x) = x\,y(x) \tag{1}$$

```
> dsolve(one);
```

$$y(x) = \_C1\, e^{\frac{1}{2}x^2} \tag{2}$$

1

```
> two:=x^2*diff(y(x),x)=(y(x))^2+y(x)*x;
```

$$two := x^2 \left(\frac{d}{dx} y(x) \right) = y(x)^2 + x\,y(x) \tag{3}$$

```
> dsolve(two);
```

$$y(x) = -\frac{x}{\ln(x) - \_C1} \tag{4}$$

1

```
> thre:=diff(y(x),x)+y(x)*x=x;
```

$$thre := \frac{d}{dx} y(x) + x\,y(x) = x \tag{5}$$

```
> dsolve(thre);
```

$$y(x) = 1 + e^{-\frac{1}{2}x^2} \_C1 \tag{6}$$

```
> four:=diff(y(x),x)+y(x)*sin(x)-y(x)^2*cos(x)=0;
```

$$four := \frac{d}{dx} y(x) + y(x)\sin(x) - y(x)^2\cos(x) = 0 \tag{7}$$

```
> dsolve(four);
```

$$y(x) = \frac{e^{\cos(x)}}{\int \left(-e^{\cos(x)} \cos(x) \right) dx + \_C1} \tag{8}$$

:

```
> five:=diff(y(x),x)+y(x)*sin(x)=0;
```

$$five := \frac{d}{dx} y(x) + y(x)\sin(x) = 0 \tag{9}$$

```
> dsolve(five);
```

$$y(x) = \_C1\, e^{\cos(x)} \tag{10}$$

```
> ics1:=y(0)=1;
```

$$ics1 := y(0) = 1 \tag{11}$$

```
> dsolve({five,ics1});
```

$$y(x) = \frac{e^{\cos(x)}}{e} \tag{12}$$

```
> ics2:=y(0)=exp(1);
```

$$ics2 := y(0) = e \tag{13}$$

```
> dsolve({five,ics2});
```

$$y(x) = e^{\cos(x)} \tag{14}$$

2

```
> one2:=diff(y(x),x,x)=-y(x);
```

$$one2 := \frac{d^2}{dx^2} y(x) = -y(x) \tag{15}$$

```
> dsolve(one2);
```

$$y(x) = \_C1 \sin(x) + \_C2 \cos(x) \tag{16}$$

```
> two2:=diff(y(x),x,x)=x^2+diff(y(x),x);
```

$$two2 := \frac{d^2}{dx^2} y(x) = x^2 + \frac{d}{dx} y(x) \tag{17}$$

```
> dsolve(two2);
```

$$y(x) = -x^2 - \frac{1}{3} x^3 + \_C1\, e^x - 2x + \_C2 \tag{18}$$

```
> thre2:=diff(y(x),x,x)=sin(2*x-1);
```

$$thre2 := \frac{d^2}{dx^2} y(x) = \sin(2x - 1) \tag{19}$$

```
> dsolve(thre2);
```

$$y(x) = -\frac{1}{4} \sin(2x - 1) + \_C1\, x + \_C2 \tag{20}$$

2

```
> four2:=diff(y(x),x,x)+2*diff(y(x),x)-y(x)=0;
```

(21)

$$four2 := \frac{d^2}{dx^2} y(x) + 2\left(\frac{d}{dx} y(x)\right) - y(x) = 0 \quad (21)$$

```
> dsolve(four2);
```

$$y(x) = \_C1\, e^{\left(\sqrt{2}-1\right)x} + \_C2\, e^{-\left(\sqrt{2}+1\right)x} \quad (22)$$

2

```
> five2:=diff(y(x),x,x)+diff(y(x),x)-2*y(x)=x*sin(x);
```

$$five2 := \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) - 2\, y(x) = x \sin(x) \quad (23)$$

```
> dsolve(five2);
```

$$y(x) = e^{x}\, \_C2 + e^{-2x}\, \_C1 + \frac{1}{50}\,(-5x - 11)\cos(x) + \frac{1}{50}\,(-15x + 2)\sin(x) \quad (24)$$

:

```
> six2:=diff(y(x),x,x)+3*diff(y(x),x)+2*y(x)=exp(2*x)*sin(x);
```

$$six2 := \frac{d^2}{dx^2} y(x) + 3\left(\frac{d}{dx} y(x)\right) + 2\, y(x) = \sin(x)\, e^{2x} \quad (25)$$

```
> dsolve(six2);
```

$$y(x) = \left(-\frac{7}{170}\, e^{3x}\cos(x) + \frac{11}{170}\, e^{3x}\sin(x) - e^{-x}\, \_C1 + \_C2\right) e^{-x} \quad (26)$$

```
> ics1:=y(0)=1,(D(y))(0)=0;
```

$$ics1 := y(0) = 1, \mathrm{D}(y)(0) = 0 \quad (27)$$

```
> dsolve({six2,ics1});
```

$$y(x) = \left(-\frac{7}{170}\, e^{3x}\cos(x) + \frac{11}{170}\, e^{3x}\sin(x) - \frac{18}{17}\, e^{-x} + \frac{21}{10}\right) e^{-x} \quad (28)$$

```
> ics2:=y(0)=2,(D(y))(0)=-1;
```

$$ics2 := y(0) = 2, \mathrm{D}(y)(0) = -1 \quad (29)$$

```
> dsolve({six2,ics2});
```

$$y(x) = \left(-\frac{7}{170}\, e^{3x}\cos(x) + \frac{11}{170}\, e^{3x}\sin(x) - \frac{18}{17}\, e^{-x} + \frac{31}{10}\right) e^{-x} \quad (30)$$

1

```
> sys_ode:=diff(y(t),t)=x(t),diff(x(t),t)=-y(t);
```

$$sys\_ode := \frac{d}{dt} y(t) = x(t), \frac{d}{dt} x(t) = -y(t) \quad (31)$$

```
> dsolve([sys_ode]);
```

$$\{x(t) = \_C1 \sin(t) + \_C2 \cos(t), y(t) = -\_C1 \cos(t) + \_C2 \sin(t)\} \quad (32)$$

```
> ics:=x(0)=1,y(1)=0;
```

$$ics := x(0) = 1, y(1) = 0 \quad (33)$$

```
> dsolve([sys_ode, ics]);
```

$$\left\{x(t) = \frac{\sin(1)\sin(t)}{\cos(1)} + \cos(t), y(t) = -\frac{\sin(1)\cos(t)}{\cos(1)} + \sin(t)\right\} \quad (34)$$