

$$\begin{aligned}
 > \text{eq1b} := \text{diff}(y(x), x) = \frac{(x \cdot y(x) + y(x)^2)}{x^2}; \text{dsolve}(\text{eq1b}, y(x)) \\
 & \text{eq1b} := \frac{d}{dx} y(x) = \frac{x y(x) + y(x)^2}{x^2} \\
 & y(x) = -\frac{x}{\ln(x) - \_C1} \tag{1}
 \end{aligned}$$

$$\begin{aligned}
 > \text{eq1c} := \text{diff}(y(t), t, t) + \text{diff}(y(t), t) + y(t) = t \cdot \exp(-t); \text{dsolve}(\text{eq1c}, y(t)); \\
 & \text{eq1c} := \frac{d^2}{dt^2} y(t) + \frac{d}{dt} y(t) + y(t) = t e^{-t} \\
 & y(t) = e^{-\frac{1}{2}t} \sin\left(\frac{1}{2} \sqrt{3} t\right) \_C2 + e^{-\frac{1}{2}t} \cos\left(\frac{1}{2} \sqrt{3} t\right) \_C1 + (t+1) e^{-t} \tag{2}
 \end{aligned}$$

$$\begin{aligned}
 > \text{eq1d} := \text{diff}(y(t), t, t) + 25 \cdot y(t) = \cos(t)^2; \text{dsolve}(\text{eq1d}, y(t)); \\
 & \text{eq1d} := \frac{d^2}{dt^2} y(t) + 25 y(t) = \cos(t)^2 \\
 & y(t) = \sin(5t) \_C2 + \cos(5t) \_C1 + \frac{1}{42} \cos(2t) + \frac{1}{50} \tag{3}
 \end{aligned}$$

$$\begin{aligned}
 > \text{dsolve}\left(\left\{\text{eq1b}, y(1) = \frac{2}{3}\right\}, y(x)\right); \\
 & y(x) = -\frac{2x}{2 \ln(x) - 3} \tag{4}
 \end{aligned}$$

$$\begin{aligned}
 > \text{dsolve}(\{\text{eq1c}, y(0) = 0, D(y)(0) = -1\}, y(t)); \\
 & y(t) = -e^{-\frac{1}{2}t} \sin\left(\frac{1}{2} \sqrt{3} t\right) \sqrt{3} - e^{-\frac{1}{2}t} \cos\left(\frac{1}{2} \sqrt{3} t\right) + (t+1) e^{-t} \tag{5}
 \end{aligned}$$

$$\begin{aligned}
 > \text{dsolve}(\{\text{eq1d}, y(0) = 0, D(y)(0) = 0\}, y(t)); \\
 & y(t) = \frac{1}{50} - \frac{23}{525} \cos(5t) + \frac{1}{42} \cos(2t) \tag{6}
 \end{aligned}$$

$$\begin{aligned}
 > \text{eq3b1} := \text{diff}(x(t), t) = -3 \cdot x(t) + 4 \cdot y(t); \text{eq3b2} := \text{diff}(y(t), t) = 5 \cdot x(t) - 7 \cdot y(t) + \cos(t); \\
 & \text{eq3b1} := \frac{d}{dt} x(t) = -3 x(t) + 4 y(t) \\
 & \text{eq3b2} := \frac{d}{dt} y(t) = 5 x(t) - 7 y(t) + \cos(t) \tag{7}
 \end{aligned}$$

$$\begin{aligned}
 > \text{dsolve}(\{\text{eq3b1}, \text{eq3b2}, x(0) = 0, y(0) = -1\}, \{x(t), y(t)\}); \\
 & \left\{x(t) = -\frac{11}{60} e^{(-5+2\sqrt{6})t} \sqrt{6} + \frac{11}{60} e^{-(5+2\sqrt{6})t} \sqrt{6} + \frac{2}{5} \sin(t), y(t) = \right. \\
 & \quad \left. -\frac{11}{20} e^{-2t\sqrt{6}-5t} - \frac{11}{20} e^{2t\sqrt{6}-5t} - \frac{11}{120} e^{-2t\sqrt{6}-5t} \sqrt{6} + \frac{11}{120} e^{2t\sqrt{6}-5t} \sqrt{6} \right. \\
 & \quad \left. + \frac{1}{10} \cos(t) + \frac{3}{10} \sin(t)\right\} \tag{8}
 \end{aligned}$$

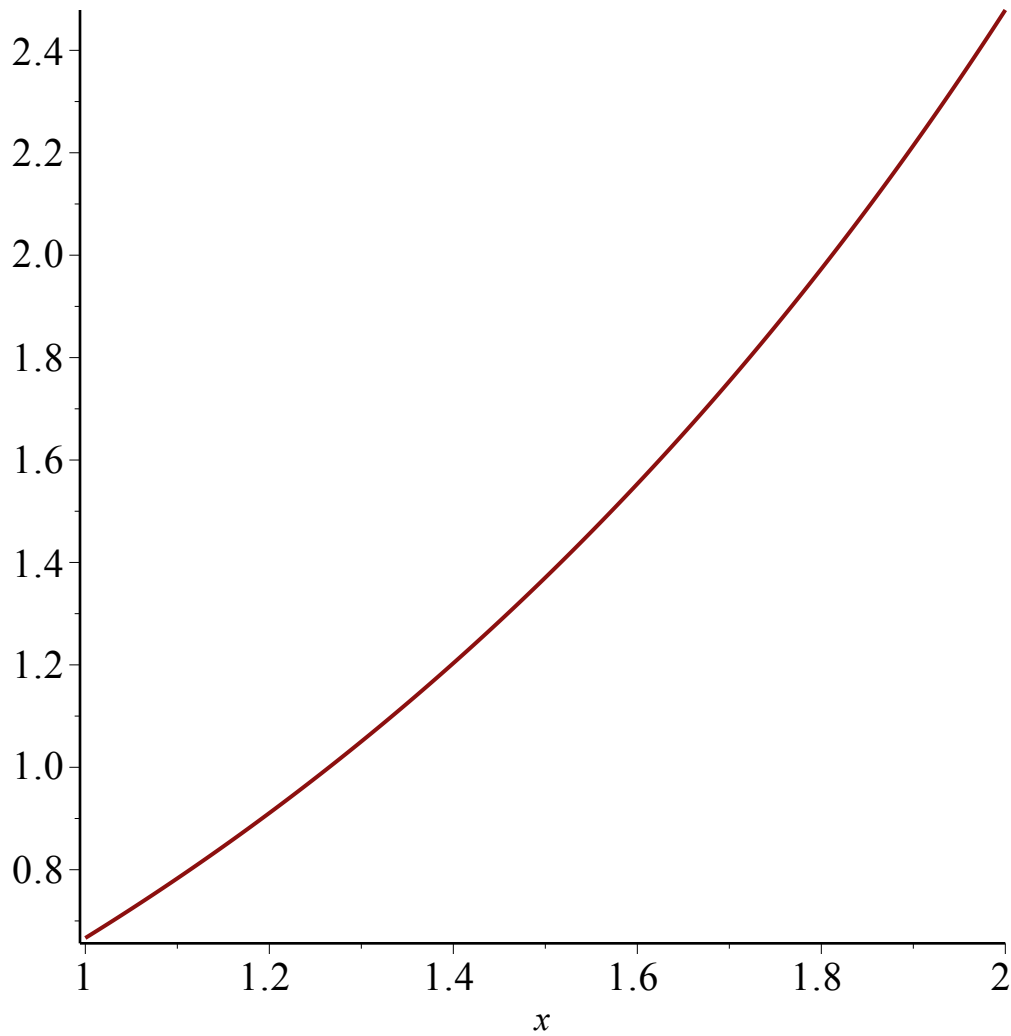


```
> ans := dsolve({eq1b, y(1) = 2/3}, y(x)); Y := eval(rhs(ans), x = 2); evalf(Y);  
plot(rhs(ans), x = 1..2)
```

$$ans := y(x) = -\frac{2x}{2\ln(x) - 3}$$

$$Y := -\frac{4}{2\ln(2) - 3}$$

2.478766823

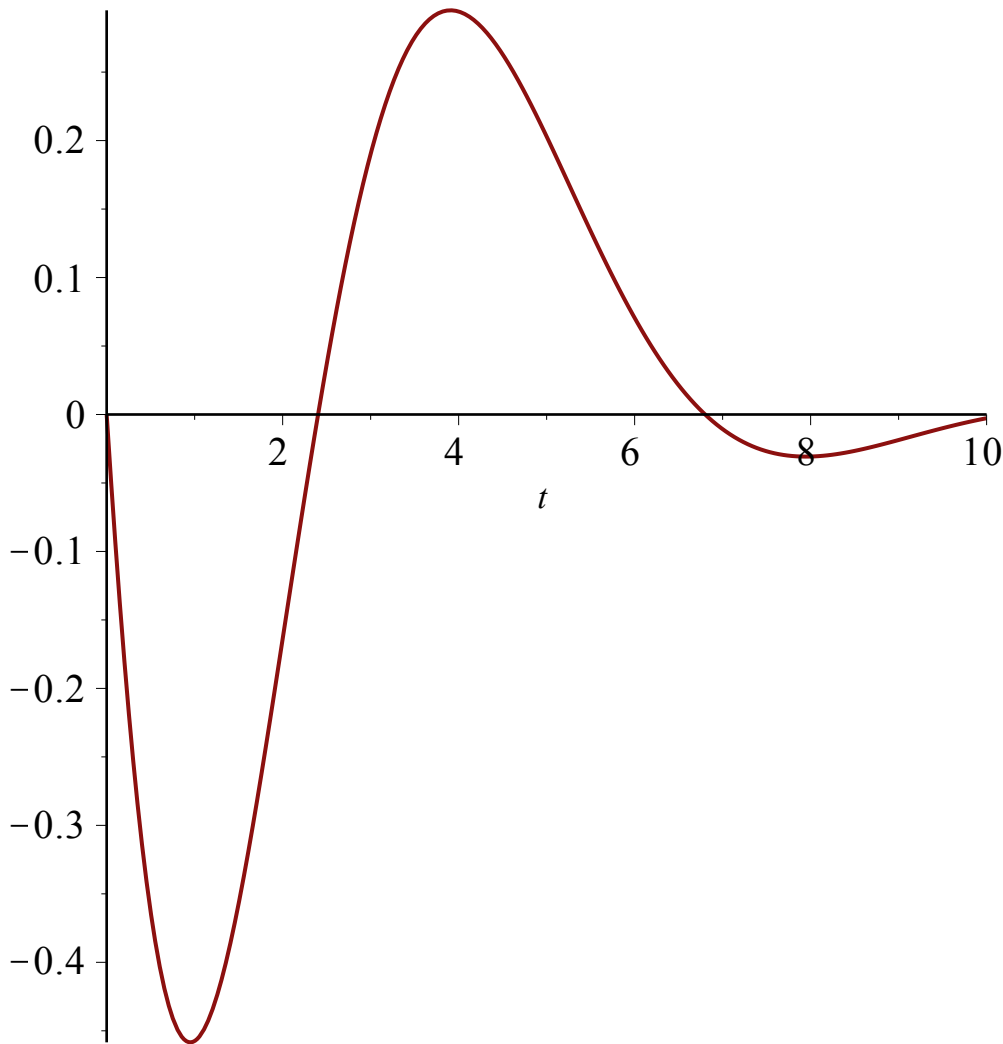


```
> ans := dsolve({eq1c, y(0) = 0, D(y)(0) = -1}, y(t)); Y := eval(rhs(ans), t = 2); evalf(Y);  
plot(rhs(ans), t = 0..10);
```

$$ans := y(t) = -e^{-\frac{1}{2}t} \sin\left(\frac{1}{2}\sqrt{3}t\right)\sqrt{3} - e^{-\frac{1}{2}t} \cos\left(\frac{1}{2}\sqrt{3}t\right) + (t+1)e^{-t}$$

$$Y := -e^{-1} \sin(\sqrt{3})\sqrt{3} - e^{-1} \cos(\sqrt{3}) + 3e^{-2}$$

-0.1638481452

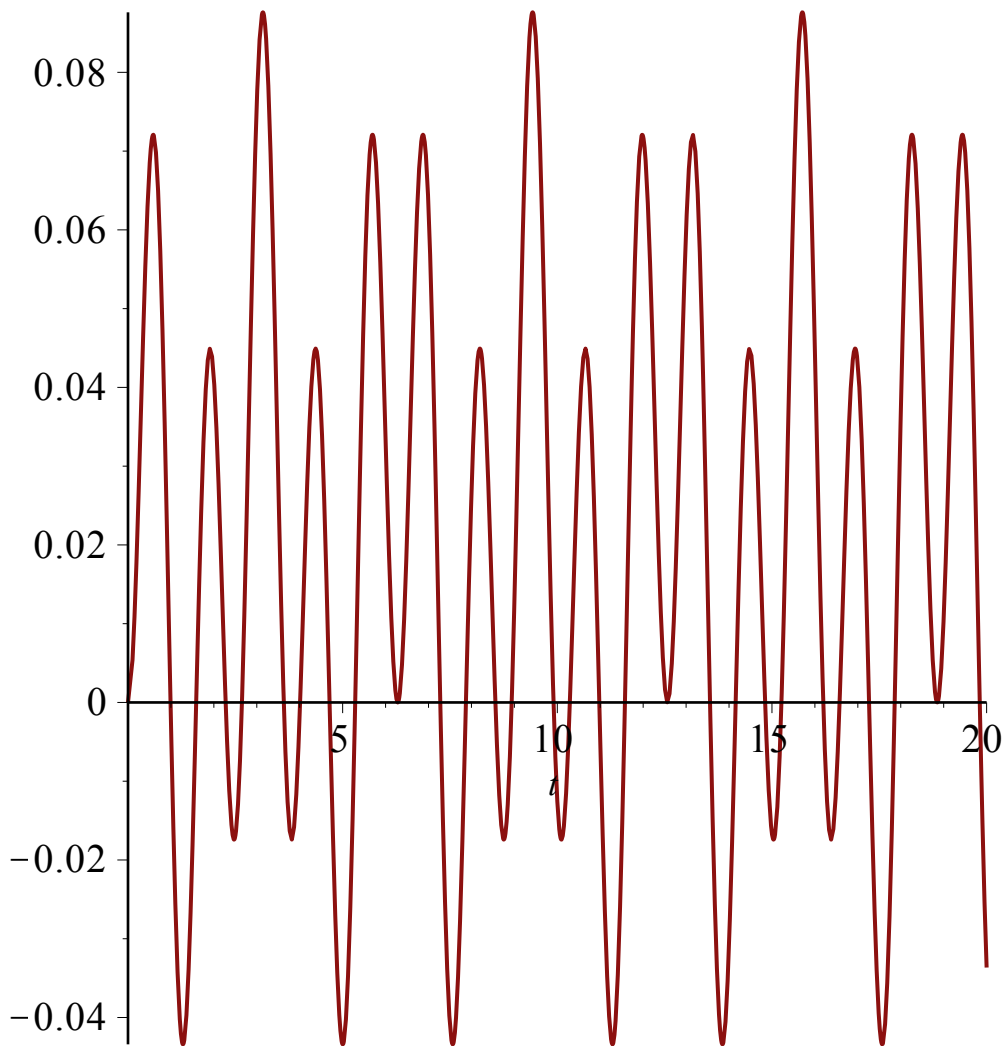


```
> ans := dsolve({eq1d, y(0) = 0, D(y)(0) = 0}, y(t)); Y := eval(rhs(ans), t = 2); evalf(Y);
plot(rhs(ans), t = 0..20);
```

$$ans := y(t) = \frac{1}{50} - \frac{23}{525} \cos(5t) + \frac{1}{42} \cos(2t)$$

$$Y := \frac{1}{50} - \frac{23}{525} \cos(10) + \frac{1}{42} \cos(4)$$

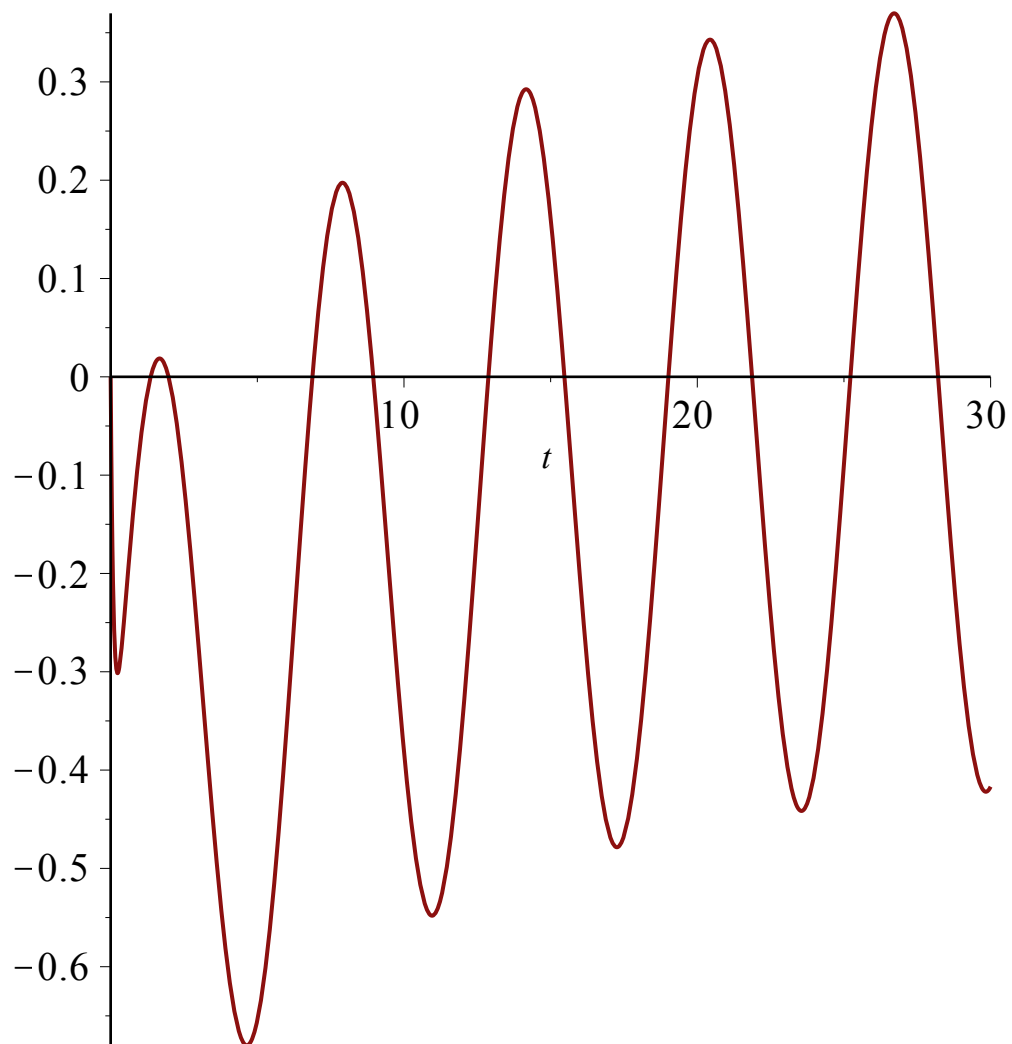
0.04119638077

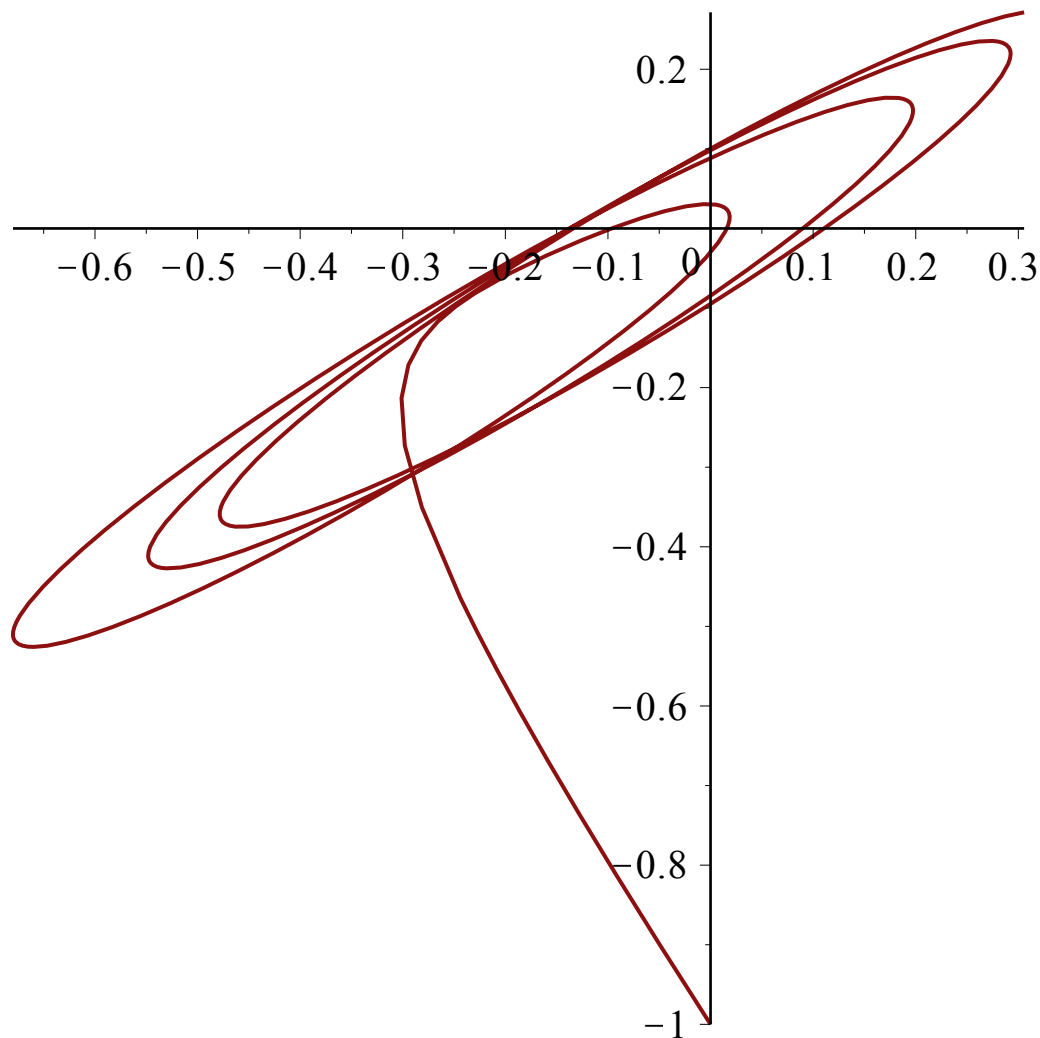


> ans := dsolve({eq3b1, eq3b2, x(0) = 0, y(0) = -1}, {x(t), y(t)}); X := rhs(ans[1]); Y := rhs(ans[2]); eval(X, t = 20); evalf(eval(X, t = 20)); plot(X, t = 0..30); plot([X, Y, t = 0..20]);

$$\begin{aligned}
 \text{ans} := & \left\{ x(t) = -\frac{11}{60} e^{(-5+2\sqrt{6})t} \sqrt{6} + \frac{11}{60} e^{-(5+2\sqrt{6})t} \sqrt{6} + \frac{2}{5} \sin(t), y(t) = \right. \\
 & -\frac{11}{20} e^{-2t\sqrt{6}-5t} - \frac{11}{20} e^{2t\sqrt{6}-5t} - \frac{11}{120} e^{-2t\sqrt{6}-5t} \sqrt{6} + \frac{11}{120} e^{2t\sqrt{6}-5t} \sqrt{6} \\
 & \left. + \frac{1}{10} \cos(t) + \frac{3}{10} \sin(t) \right\} \\
 X := & -\frac{11}{60} e^{(-5+2\sqrt{6})t} \sqrt{6} + \frac{11}{60} e^{-(5+2\sqrt{6})t} \sqrt{6} + \frac{2}{5} \sin(t) \\
 Y := & -\frac{11}{20} e^{-2t\sqrt{6}-5t} - \frac{11}{20} e^{2t\sqrt{6}-5t} - \frac{11}{120} e^{-2t\sqrt{6}-5t} \sqrt{6} + \frac{11}{120} e^{2t\sqrt{6}-5t} \sqrt{6} \\
 & + \frac{1}{10} \cos(t) + \frac{3}{10} \sin(t) \\
 & -\frac{11}{60} e^{-100+40\sqrt{6}} \sqrt{6} + \frac{11}{60} e^{-100-40\sqrt{6}} \sqrt{6} + \frac{2}{5} \sin(20)
 \end{aligned}$$

0.3056305330





> with(plots);

[animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra\_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions, setoptions3d, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubepplot]

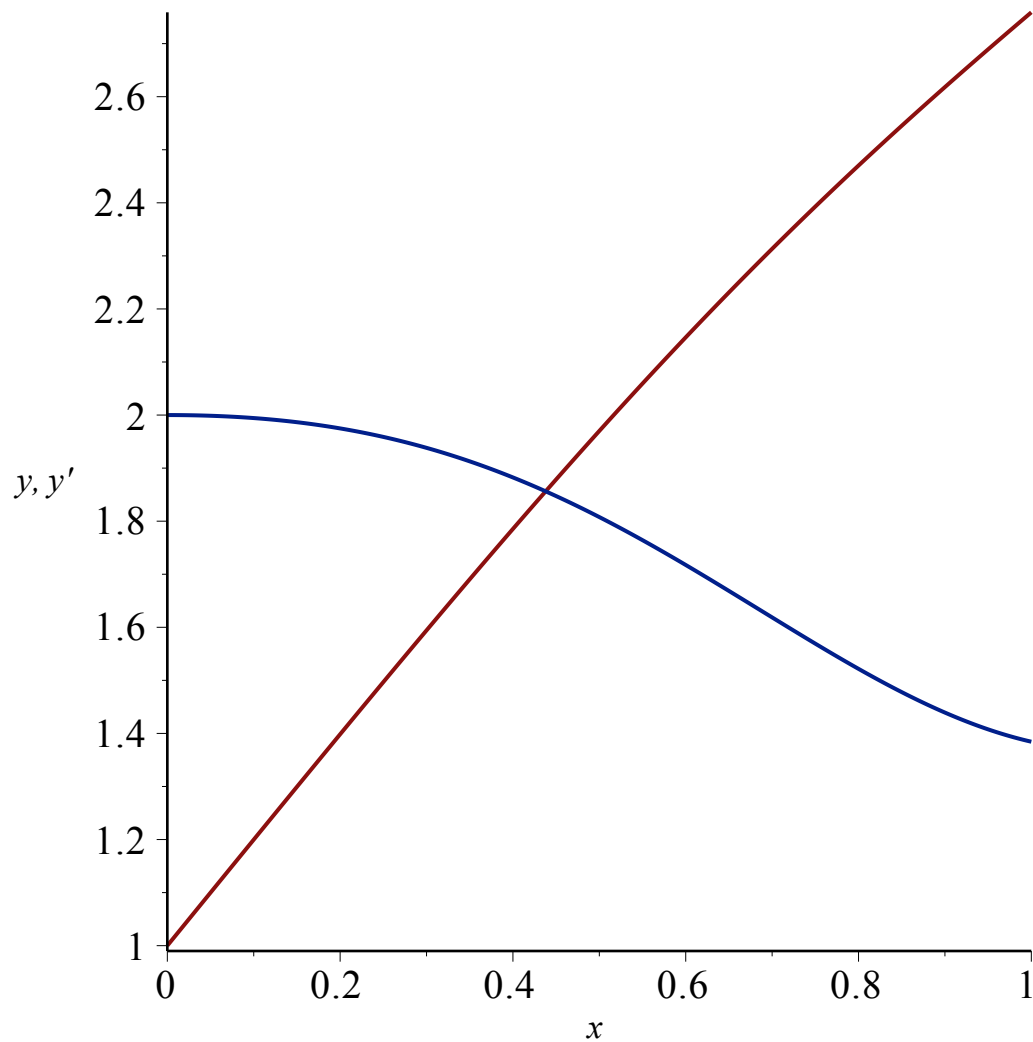
(9)

> eq := diff(y(x), x, x) + sin(x\*y(x)) = 0; ans := dsolve({eq, y(0) = 1, D(y)(0) = 2}, [y(x)], numeric); ans(1); odeplot(ans, [[x, y(x)], [x, diff(y(x), x) ]], 0..1);

$$eq := \frac{d^2}{dx^2} y(x) + \sin(x y(x)) = 0$$

ans := proc(x\_rkf45) ... end proc

$$\left[ x = 1., y(x) = 2.75898991516471, \frac{d}{dx} y(x) = 1.38435771570047 \right]$$



```
> eq1 := diff(x(t), t) = x(t)^2 - x(t) * y(t)^2; eq2 := diff(y(t), t) = -y(t) + x(t)^3; ans
:= dsolve({eq1, eq2, x(0) = 1, y(0) = -1}, [x(t), y(t)], numeric); ans(1); odeplot(ans,
[[t, x(t)], [t, y(t)]], 0..2); odeplot(ans, [x(t), y(t)], 0..2);
```

$$eq1 := \frac{d}{dt} x(t) = x(t)^2 - x(t) y(t)^2$$

$$eq2 := \frac{d}{dt} y(t) = -y(t) + x(t)^3$$

```
ans := proc(x_rkf45) ... end proc
```

```
[t = 1., x(t) = 1.12889701208019, y(t) = 2.19691278105391]
```

