```
> restart
> ec:=diff(y(x),x)-y(x)/x=m*x
```

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

```
> sol:=dsolve(ec,y(x))
```

$$sol := y(x) = \left(m\,x + c_1\right) x \tag{2}$$

```
> cond:=y(1)=1
```

$$cond := y(1) = 1 \tag{3}$$

```
> f:=unapply(rhs(sol),x,m,c__1)
```

$$f := \left(x, m, c_1\right) \mapsto \left(m \cdot x + c_1\right) \cdot x \tag{4}$$

```
> solve(f(2,m,c__1)=0,m)
```

$$-\frac{c_1}{2} \tag{5}$$

```
> solve(f(1,-c__1/2,c__1)=1,c__1)
```

$$2 \tag{6}$$

```
> sol1:=f(x,-1,2)
```

$$sol1 := \left(-x + 2\right) x \tag{7}$$

```
> restart
> ec:=x^2*diff(y(x),x$2)+3*x*diff(y(x),x)+y(x)=0
```

$$ec := x^2 \left(\frac{d^2}{dx^2} y(x)\right) + 3\,x \left(\frac{d}{dx} y(x)\right) + y(x) = 0 \tag{8}$$

```
> sol:=dsolve(ec,y(x))
```

$$sol := y(x) = \frac{c_1}{x} + \frac{c_2 \ln(x)}{x} \tag{9}$$

```
> cond:=y(1)=1,D(y)(1)=1
```

$$cond := y(1) = 1, D(y)(1) = 1 \tag{10}$$

```
> 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*, (11)

setoptions3d, *shadebetween*, *spacecurve*, *sparsematrixplot*, *surfdata*, *textplot*, *textplot3d*, *tubeplot*]

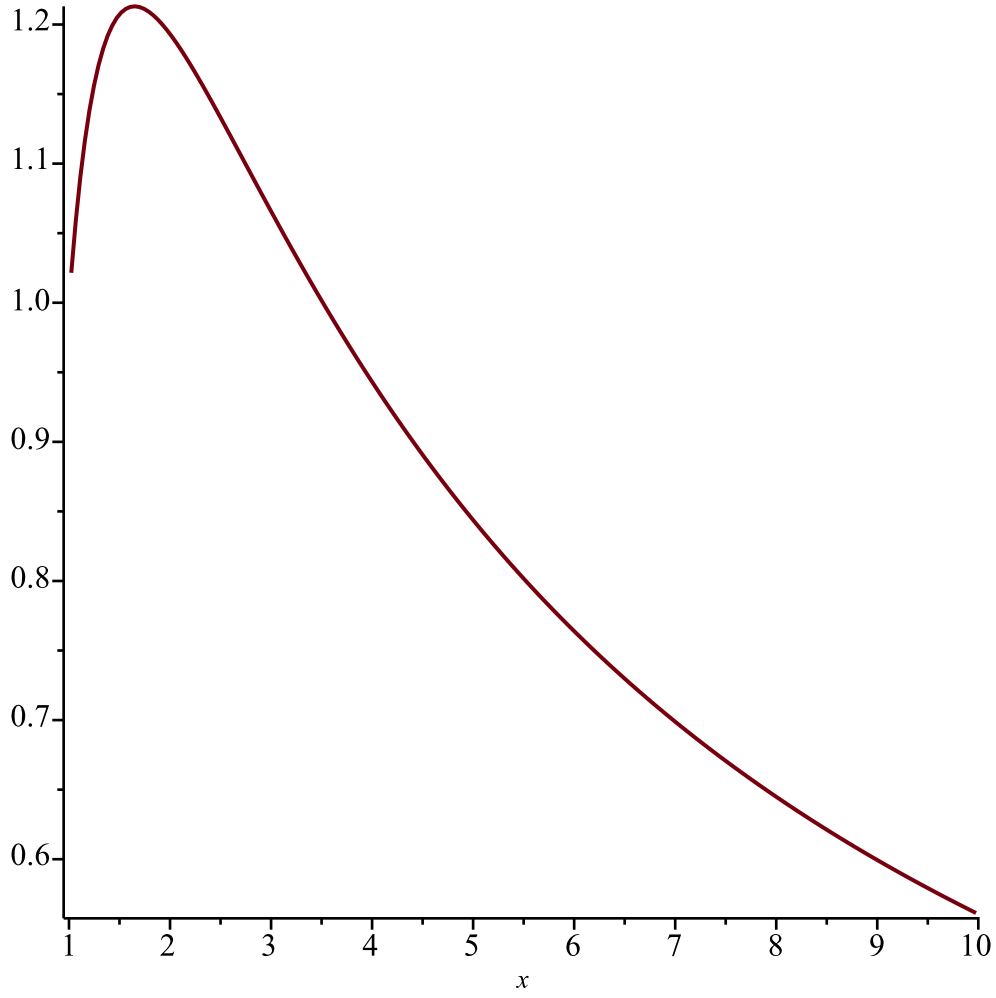
```
> sol2:=dsolve({ec,cond},y(x))
```

$$sol2 := y(x) = \frac{1 + 2\ln(x)}{x} \tag{12}$$

```
> f:=unapply(rhs(sol2),x)
```

$$f := x \mapsto \frac{1 + 2\cdot\ln(x)}{x} \tag{13}$$

```
> plot([f(x)],x=1..10)
```




```
> restart
> with(DEtools)
```

[*AreSimilar*, *Closure*, *DEnormal*, *DEplot*, *DEplot3d*, *DEplot_polygon*, *DFactor*, *DFactorLCLM*, *DFactorsols*, *Dchangevar*, *Desingularize*, *FindODE*, *FunctionDecomposition*, *GCRD*, *Gosper*, *Heunsols*, *Homomorphisms*, *IVPsol*, *IsHyperexponential*, *LCLM*, *MeijerGsols*, *MultiplicativeDecomposition*, *ODEInvariants*, *PDEchangecoords*, *PolynomialNormalForm*, *RationalCanonicalForm*, *ReduceHyperexp*, *RiemannPsols*, *Xchange*, *Xcommutator*, *Xgauge*, (14)

Zeilberger, *abelsol*, *adjoint*, *autonomous*, *bernoullisol*, *buildsol*, *buildsym*, *canoni*, *caseplot*, *casesplit*, *checkrank*, *chinisol*, *clairautsol*, *constcoeffsols*, *convertAlg*, *convertsys*, *dalembertsol*, *dcoeffs*, *de2diffop*, *dfieldplot*, *diff_table*, *diffop2de*, *dperiodic_sols*, *dpolyform*, *dsubs*, *eigenring*, *endomorphism_charpoly*, *equinv*, *eta_k*, *eulersols*, *exactsol*, *expsols*, *exterior_power*, *firint*, *firtest*, *formal_sol*, *gen_exp*, *generate_ic*, *genhomosol*, *gensys*, *hamilton_eqs*, *hypergeometricsols*, *hypergeomsols*, *hyperode*, *indicialeq*, *infgen*, *initialdata*, *integrate_sols*, *intfactor*, *invariants*, *kovacicsols*, *leftdivision*, *liesol*, *line_int*, *linearsol*, *matrixDE*, *matrix_riccati*, *maxdimsystems*, *moser_reduce*, *muchange*, *mult*, *mutest*, *newton_polygon*, *normalG2*, *ode_int_y*, *ode_y1*, *odeadvisor*, *odepde*, *parametricsol*, *particularsol*, *phaseportrait*, *poincare*, *polysols*, *power_equivalent*, *rational_equivalent*, *ratsols*, *redode*, *reduceOrder*, *reduce_order*, *regular_parts*, *regularsp*, *remove_RootOf*, *riccati_system*, *riccatisol*, *rifread*, *rifsimp*, *rightdivision*, *rtaylor*, *separablesol*, *singularities*, *solve_group*, *super_reduce*, *symgen*, *symmetric_power*, *symmetric_product*, *symtest*, *transinv*, *translate*, *untranslate*, *varparam*, *zoom*]

```
> f:=x->x*(x+1)*(2-x)
```

$$f := x \mapsto x \cdot (x+1) \cdot (2-x) \tag{15}$$

```
> ec:=diff(x(t),t)=f(x(t))
```

$$ec := \frac{\mathrm{d}}{\mathrm{d}t} x(t) = x(t)\ (x(t)+1)\ (2-x(t)) \tag{16}$$

```
> sol:=solve(f(x)=0,x)
```

$$sol := -1, 0, 2 \tag{17}$$

```
> D(f)(sol[1])
```

$$-3 \tag{18}$$

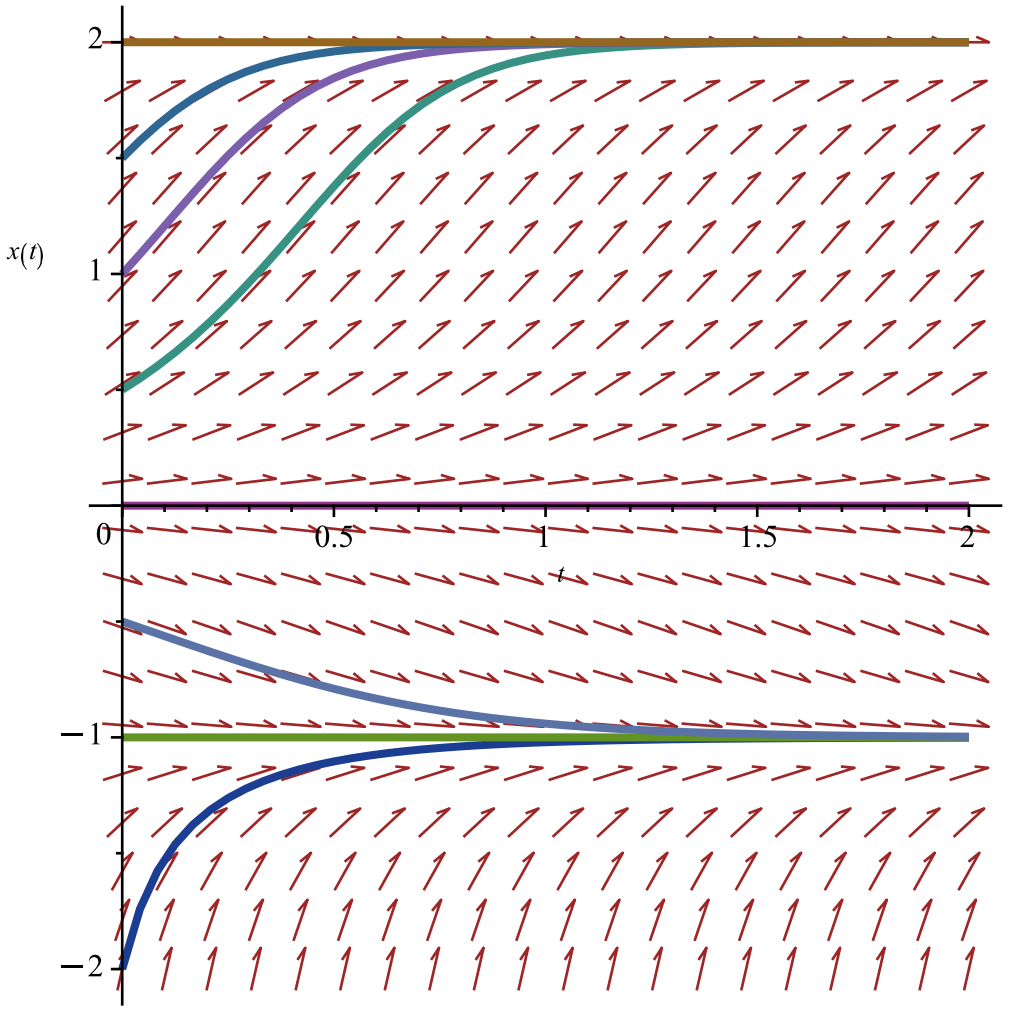
```
> D(f)(sol[2])
```

$$2 \tag{19}$$

```
> D(f)(sol[3])
```

$$-6 \tag{20}$$

```
> DEplot(ec,x(t),t=0..2,[[x(0)=-2],[x(0)=-1],[x(0)=-1/2],[x(0)=0],
  [x(0)=1/2],[x(0)=1],[x(0)=3/2],[x(0)=2]])
```




```
> restart
```

```
> ec1:=diff(y1(x),x)=-7*y1(x)-6*y2(x)
```

$$ec1 := \frac{d}{dx} y1(x) = -7\,y1(x) - 6\,y2(x) \tag{21}$$

```
> ec2:=diff(y2(x),x)=12*y1(x)+10*y2(x)
```

$$ec2 := \frac{d}{dx} y2(x) = 12\,y1(x) + 10\,y2(x) \tag{22}$$

```
> sist:=ec1,ec2
```

$$sist := \frac{d}{dx} y1(x) = -7\,y1(x) - 6\,y2(x),\ \frac{d}{dx} y2(x) = 12\,y1(x) + 10\,y2(x) \tag{23}$$

```
> dsolve({sist},{y1(x),y2(x)})
```

$$\left\{ y1(x) = c_1 e^{x} + c_2 e^{2x},\ y2(x) = -\frac{4\,c_1 e^{x}}{3} - \frac{3\,c_2 e^{2x}}{2} \right\} \tag{24}$$

```
> cond:=y1(0)=2,y2(0)=4
```

$$cond := y1(0) = 2,\ y2(0) = 4 \tag{25}$$

```
> dsolve({sist,cond},{y1(x),y2(x)})
```

$$\{y1(x) = 42\,e^{x} - 40\,e^{2x}, y2(x) = -56\,e^{x} + 60\,e^{2x}\} \quad \textbf{(26)}$$