```
> f:=x->x^2-2*x
```

$$f := x \mapsto x^2 - 2 \cdot x \qquad (1)$$

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

$$eqd := \frac{d}{dt}\, x(t) = x(t)^2 - 2\, x(t) \qquad (2)$$

> $equip := solve(f(x) = 0, x)$

$$equip := 0, 2 \qquad (3)$$

> $equip[1]$

$$0 \qquad (4)$$

> $\mathrm{D}(f)\,(equip[1])$

$$-2 \qquad (5)$$

> $\mathrm{D}(f)\,(equip[2])$

$$2 \qquad (6)$$

> $DEplot\left(eqd, x(t), t = -2\,..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) = 2], [x(0) = 3] \right]\right)$

$$DEplot\left(\frac{d}{dt}\, x(t) = x(t)^2 - 2\, x(t), x(t), t = -2\,..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) = 2], [x(0) = 3] \right]\right) \qquad (7)$$

> $with(plots)$

[*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, shadebetween, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot*] **(8)**

> $DEplot\left(eqd, x(t), t = -2\,..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) = 2], [x(0) = 3] \right]\right)$

$$DEplot\left(\frac{d}{dt}\, x(t) = x(t)^2 - 2\, x(t), x(t), t = -2\,..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) \qquad (9)$$

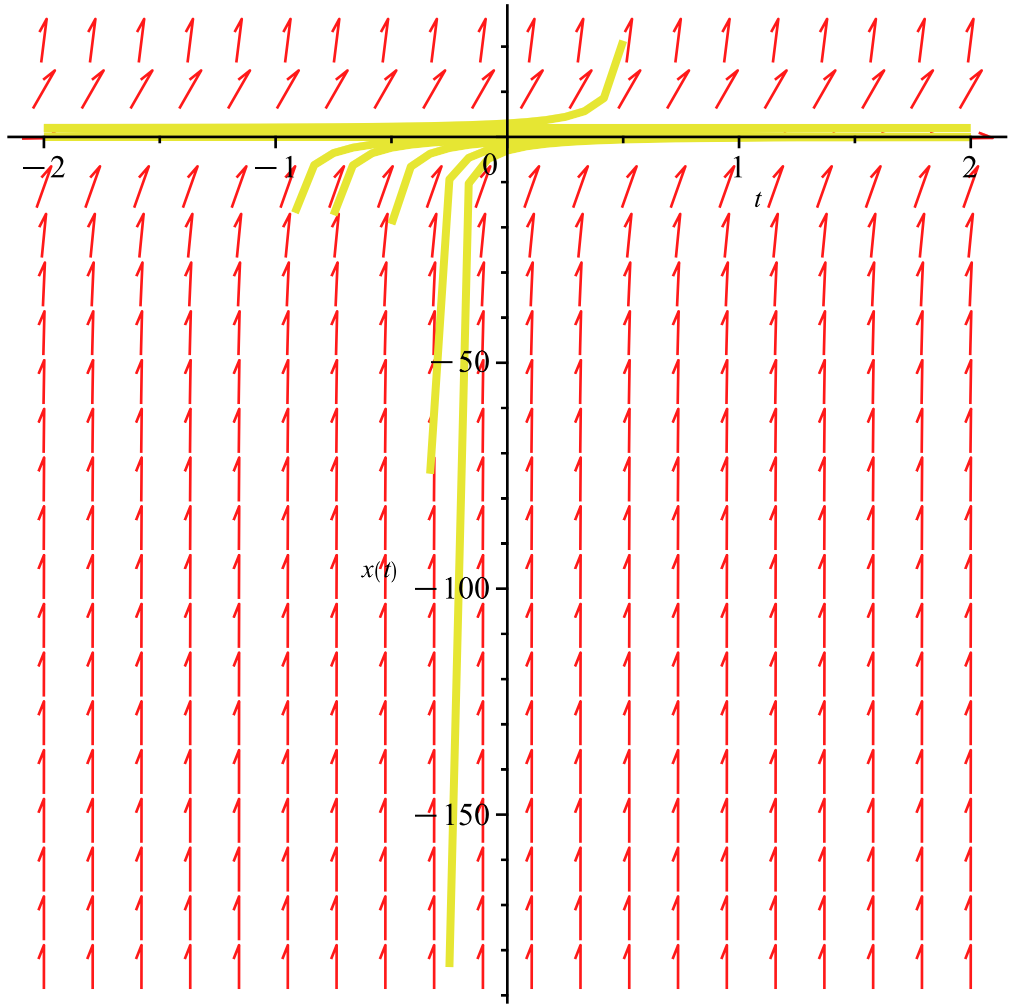
$= 2], [x(0) = 3]\Big]\Big)$

> $with(DEtools)$

$[AreSimilar, Closure, DEnormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, DFactorsols, Dchangevar, Desingularize, FindODE, FunctionDecomposition, GCRD, Gosper, Heunsols, Homomorphisms, IVPsol, IsHyperexponential, LCLM, MeijerGsols, MultiplicativeDecomposition, ODEInvariants, PDEchangecoords, PolynomialNormalForm, RationalCanonicalForm, ReduceHyperexp, RiemannPsols, Xchange, Xcommutator, Xgauge, Zeilberger, abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym, canoni, caseplot, casesplit, checkrank, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys, dalembertsol, dcoeffs, de2diffop, dfieldplot, diff\_table, diffop2de, dperiodic\_sols, dpolyform, dsubs, eigenring, endomorphism\_charpoly, equinv, eta\_k, eulersols, exactsol, expsols, exterior\_power, firint, firtest, formal\_sol, gen\_exp, generate\_ic, genhomosol, gensys, hamilton\_eqs, hypergeometricsols, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate\_sols, intfactor, invariants, kovacicsols, leftdivision, liesol, line\_int, linearsol, matrixDE, matrix\_riccati, maxdimsystems, moser\_reduce, muchange, mult, mutest, newton\_polygon, normalG2, ode\_int\_y, ode\_y1, odeadvisor, odepde, parametricsol, particularsol, phaseportrait, poincare, polysols, power\_equivalent, rational\_equivalent, ratsols, redode, reduceOrder, reduce\_order, regular\_parts, regularsp, remove\_RootOf, riccati\_system, riccatisol, rifread, rifsimp, rightdivision, rtaylor, separablesol, singularities, solve\_group, super\_reduce, symgen, symmetric\_power, symmetric\_product, symtest, transinv, translate, untranslate, varparam, zoom]$ **(10)**

> $DEplot\left(eqd, x(t), t = -2..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) = 2], [x(0) = 3]\right]\right)$

```
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further left of -.25541281, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further left of -.34657359, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further left of -.54930616, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further left of -.97295514, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further left of -.80471900, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .54930618, probably
a singularity
```



>

> $f := x \rightarrow x \cdot (x-1) \cdot (x-2)$

$$f := x \mapsto x \cdot (x-1) \cdot (x-2) \quad \textbf{(11)}$$

> $deq := diff(x(t), t) = f(x(t))$

$$deq := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t)\ (x(t)-1)\ (x(t)-2) \quad \textbf{(12)}$$

> $equip := solve(f(x) = 0, x)$

$$equip := 0, 1, 2 \quad \textbf{(13)}$$

> $equip[1]$

$$0 \quad \textbf{(14)}$$

> $\mathrm{D}(f)\ (equip[1])$

$$2 \quad \textbf{(15)}$$

> $\mathrm{D}(f)\ (equip[2])$

$$-1 \quad \textbf{(16)}$$

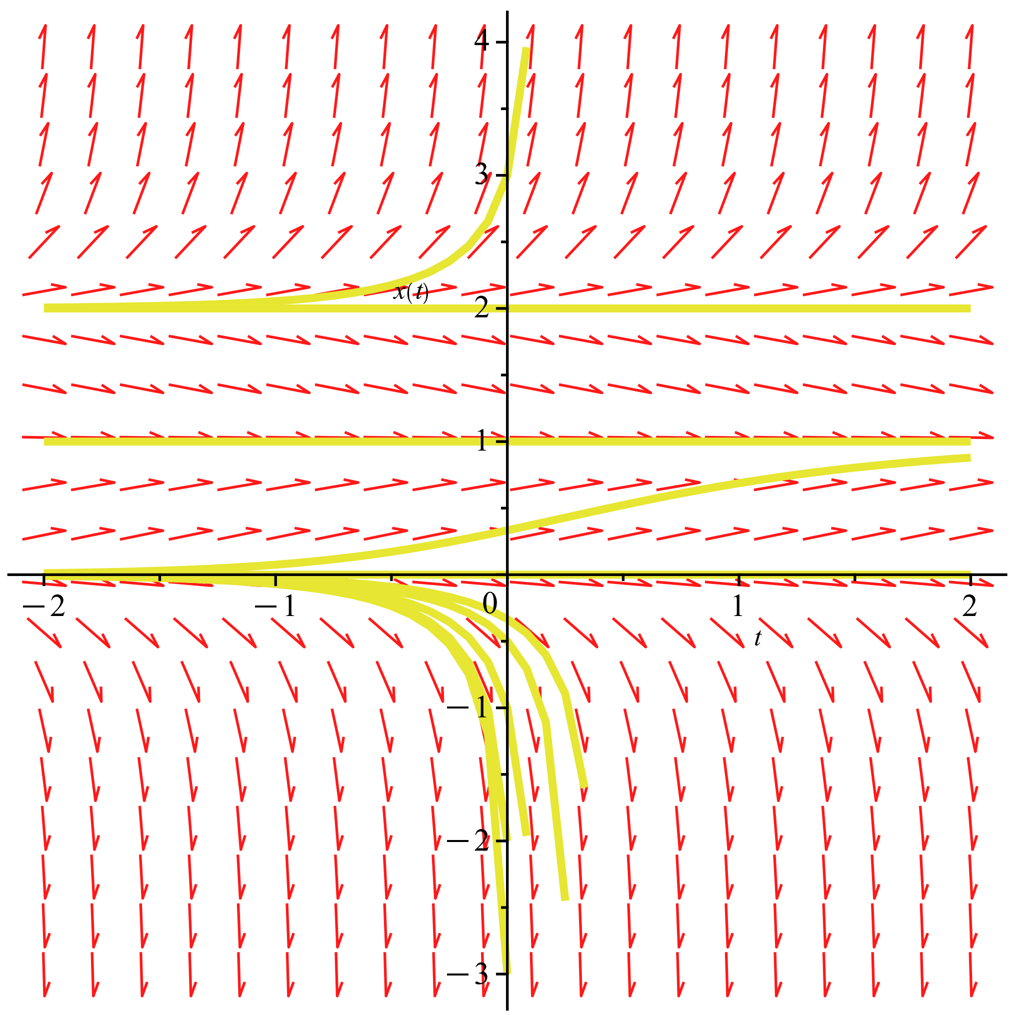
> $\mathrm{D}(f)\ (equip[3])$

$$2 \quad \textbf{(17)}$$

> $DEplot\Big(deq, x(t), t=-2..2, \Big[[x(0)=-3], [x(0)=-2], [x(0)=-1], \Big[x(0)=-\frac{1}{2}\Big], \Big[x(0)=$

$-\frac{1}{3}\Big]$, $[x(0)=0]$, $\Big[x(0)=\frac{1}{3}\Big]$, $\Big[x(0)=-\frac{1}{2}\Big]$, $[x(0)=1]$, $[x(0)=2]$, $[x(0)=3]\Big]\Big)$

```
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .32269256e-1,
probably a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .58891510e-1,
probably a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .14384102, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .41333927, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .29389331, probably
a singularity
Warning, plot may be incomplete, the following errors(s) were issued:
   cannot evaluate the solution further right of .14384100, probably
a singularity
```



>

>

> $f := x \rightarrow \sin(x)$

$$f := x \mapsto \sin(x) \qquad \textbf{(18)}$$

> $eqd := diff(x(t), t) = f(x(t))$

$$eqd := \frac{d}{dt}\, x(t) = \sin(x(t)) \qquad \textbf{(19)}$$

> $equip := solve(f(x) = 0)$

$$equip := 0 \qquad \textbf{(20)}$$

> $\_EnvAllSolutions := true$

$$\_EnvAllSolutions := true \qquad \textbf{(21)}$$

> $equip := solve(f(x) = 0)$

$$equip := \pi\, \_Z1\sim \qquad \textbf{(22)}$$

> $equip[1]$

$$(\pi\, \_Z1\sim)_1 \qquad \textbf{(23)}$$

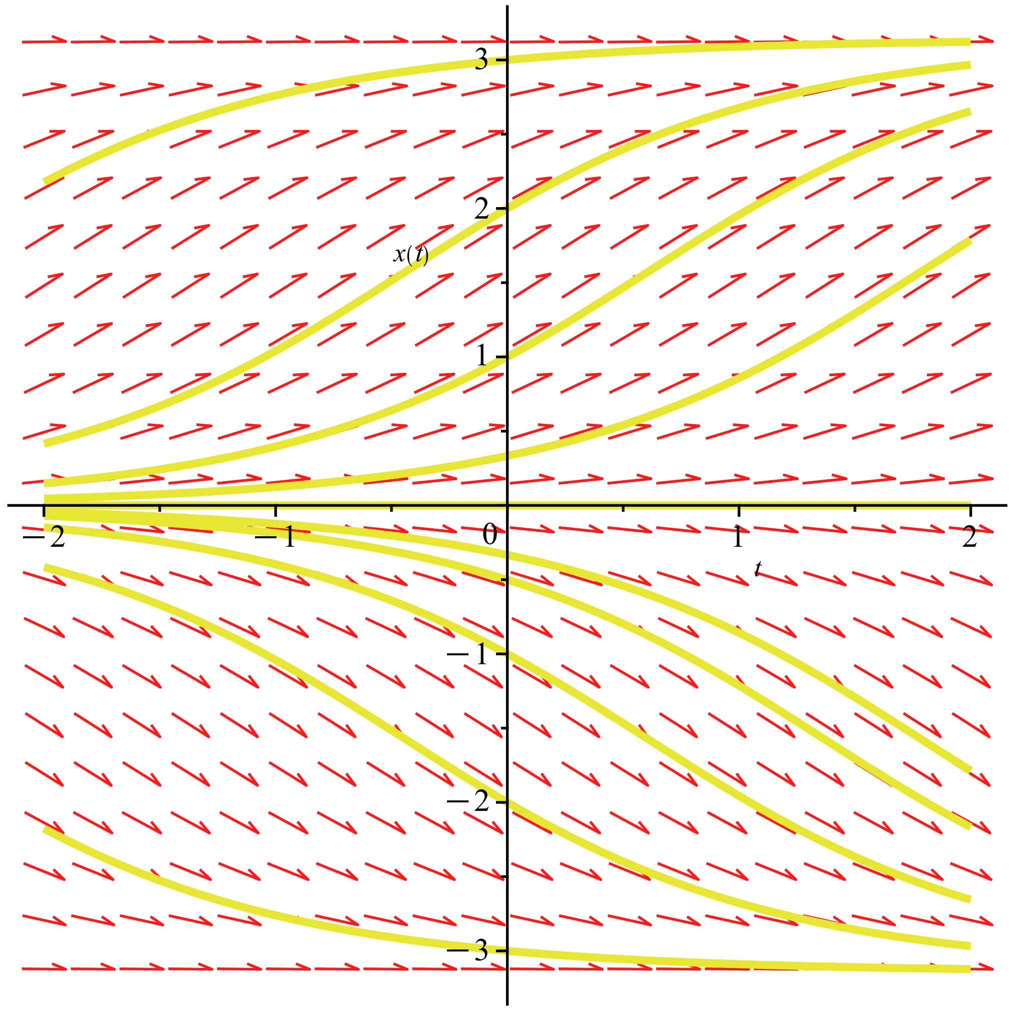
> $equip[2]$

$$(\pi\, \_Z1\sim)_2 \qquad \textbf{(24)}$$

> $\mathrm{D}(f)\,(equip)$

$$(-1)^{\_Z1\sim} \qquad \textbf{(25)}$$

> $DEplot\left(eqd, x(t), t = -2\,..2, \left[[x(0) = -3], [x(0) = -2], [x(0) = -1], \left[x(0) = -\frac{1}{2}\right], \left[x(0) = -\frac{1}{3}\right], [x(0) = 0], \left[x(0) = \frac{1}{3}\right], \left[x(0) = -\frac{1}{2}\right], [x(0) = 1], [x(0) = 2], [x(0) = 3] \right]\right)$



>

> with(linalg)

[BlockDiagonal, GramSchmidt, JordanBlock, LUdecomp, QRdecomp, Wronskian, addcol, addrow, adj, adjoint, angle, augment, backsub, band, basis, bezout, blockmatrix, charmat, charpoly, cholesky, col, coldim, colspace, colspan, companion, concat, cond, copyinto, crossprod, curl, definite, delcols, delrows, det, diag, diverge, dotprod, eigenvals, eigenvalues, eigenvectors, eigenvects, entermatrix, equal, exponential, extend, ffgausselim, fibonacci, forwardsub, frobenius, gausselim, gaussjord, geneqns, genmatrix, grad, hadamard, hermite, hessian, hilbert, htranspose, ihermite, indexfunc, innerprod, intbasis, inverse, ismith, issimilar, iszero, jacobian, jordan, kernel, laplacian, leastsqrs, linsolve, matadd, matrix, minor, minpoly, mulcol, mulrow, multiply, norm, normalize, nullspace, orthog, permanent, pivot, potential, randmatrix, randvector, rank, ratform, row, rowdim, rowspace, rowspan, rref, scalarmul, singularvals, smith, stackmatrix, submatrix, subvector, sumbasis, swapcol, swaprow, sylvester, toeplitz, trace, transpose, vandermonde, vecpotent, vectdim, vector, wronskian] **(26)**

> $eq1 := diff(x(t), t) = 2 \cdot x(t) + y(t)$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = 2\, x(t) + y(t) \quad \textbf{(27)}$$

> $eq2 := diff(y(t), t) = x(t) + 2 \cdot y(t)$

$$eq2 := \frac{d}{dt}\, y(t) = x(t) + 2\, y(t) \tag{28}$$

> $sist := eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = 2\, x(t) + y(t),\ \frac{d}{dt}\, y(t) = x(t) + 2\, y(t) \tag{29}$$

> $A := matrix([[2, 1], [1, 2]])$

$$A := \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \tag{30}$$

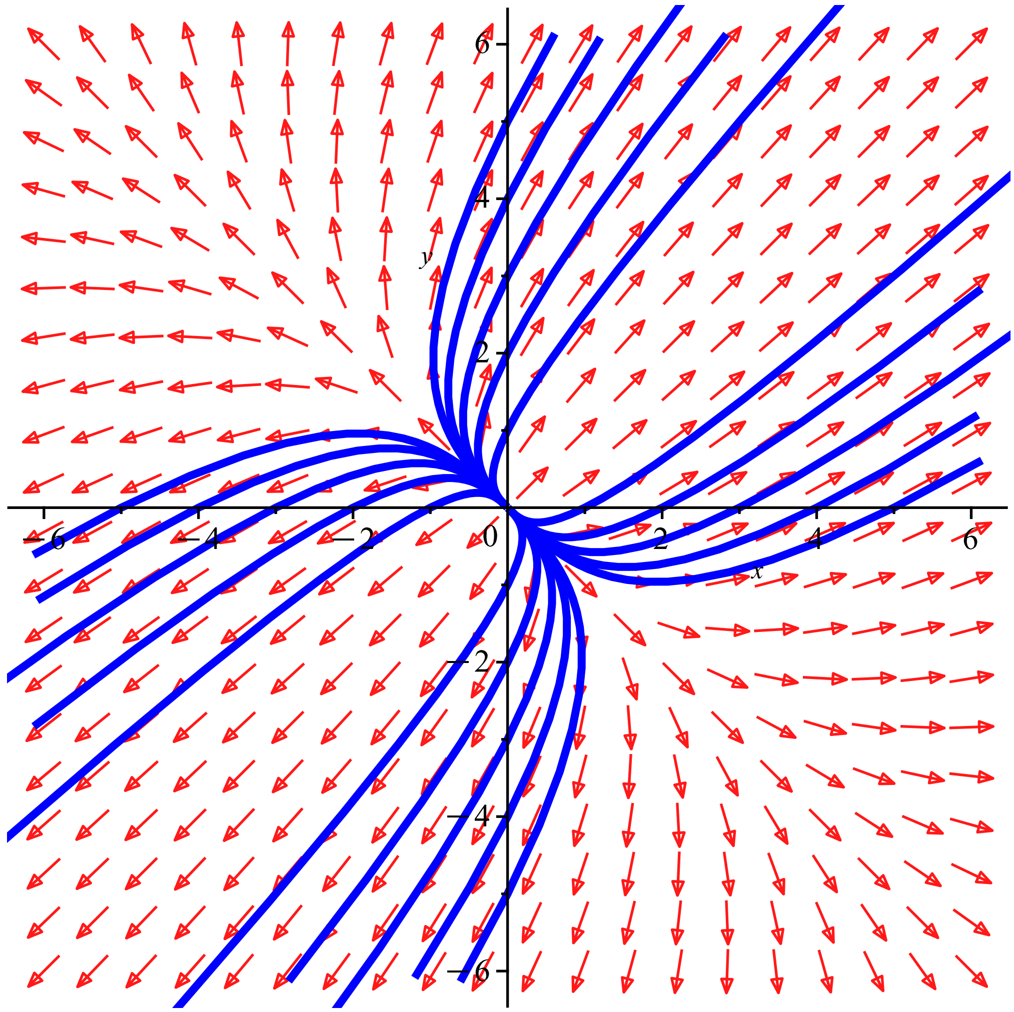
> $eigenvals(A)$

$$3, 1 \tag{31}$$

> $in\_cond := [x(0) = 0, y(0) = i]\$i = 1..5, [x(0) = -i, y(0) = 0]\$i = 1..5, [x(0) = 0, y(0) = -i]\$i = 1..5, [x(0) = i, y(0) = 0]\$i = 1..5$

$$in\_cond := [x(0) = 0, y(0) = 1], [x(0) = 0, y(0) = 2], [x(0) = 0, y(0) = 3], [x(0) = 0, y(0) = 4], [x(0) = 0, y(0) = 5], [x(0) = -1, y(0) = 0], [x(0) = -2, y(0) = 0], [x(0) = -3, y(0) = 0], [x(0) = -4, y(0) = 0], [x(0) = -5, y(0) = 0], [x(0) = 0, y(0) = -1], [x(0) = 0, y(0) = -2], [x(0) = 0, y(0) = -3], [x(0) = 0, y(0) = -4], [x(0) = 0, y(0) = -5], [x(0) = 1, y(0) = 0], [x(0) = 2, y(0) = 0], [x(0) = 3, y(0) = 0], [x(0) = 4, y(0) = 0], [x(0) = 5, y(0) = 0] \tag{32}$$

> $DEplot([sist], [x(t), y(t)], t = -5..5, x = -6..6, y = -6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> $eq1 := diff(x(t), t) = -3 \cdot x(t) + 4 \cdot y(t)$

$$eq1 := \frac{d}{dt}\, x(t) = -3\, x(t) + 4\, y(t) \quad (33)$$

> $eq2 := diff(y(t), t) = -2 \cdot x(t) + 3 \cdot y(t)$

$$eq2 := \frac{d}{dt}\, y(t) = -2\, x(t) + 3\, y(t) \quad (34)$$

> $sist := eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = -3\, x(t) + 4\, y(t), \frac{d}{dt}\, y(t) = -2\, x(t) + 3\, y(t) \quad (35)$$

> $A := matrix([[-3, 4], [-2, 3]])$

$$A := \begin{bmatrix} -3 & 4 \\ -2 & 3 \end{bmatrix} \quad (36)$$

> $eigenvals(A)$

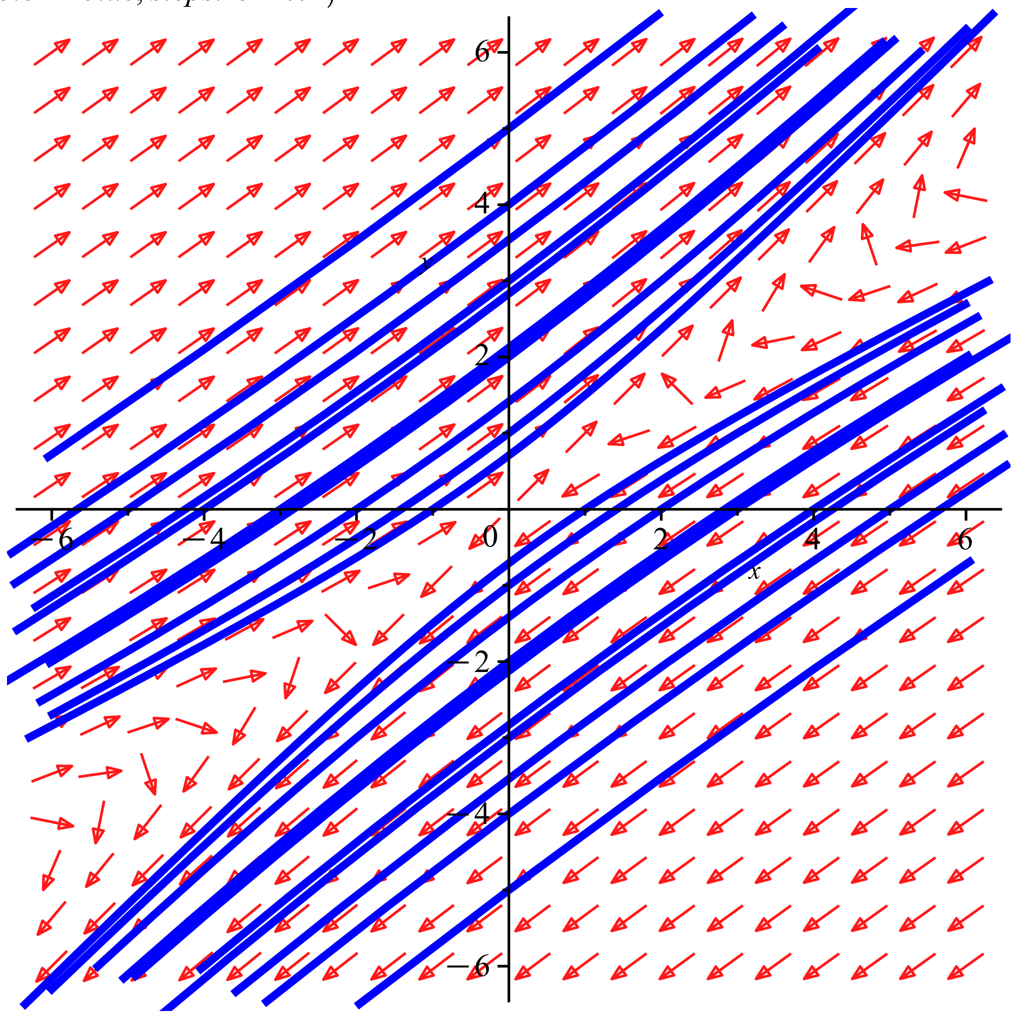
$$1, -1 \quad (37)$$

> $in\_cond := [x(0) = 0, y(0) = i]\$i = 1..5, [x(0) = -i, y(0) = 0]\$i = 1..5, [x(0) = 0, y(0) = -i]\$i = 1..5, [x(0) = i, y(0) = 0]\$i = 1..5$

$$in\_cond := [x(0) = 0, y(0) = 1], [x(0) = 0, y(0) = 2], [x(0) = 0, y(0) = 3], [x(0) = 0, y(0) \quad (38)$$

$= 4], [x(0) = 0, y(0) = 5], [x(0) = -1, y(0) = 0], [x(0) = -2, y(0) = 0], [x(0) = -3, y(0) = 0], [x(0) = -4, y(0) = 0], [x(0) = -5, y(0) = 0], [x(0) = 0, y(0) = -1], [x(0) = 0, y(0) = -2], [x(0) = 0, y(0) = -3], [x(0) = 0, y(0) = -4], [x(0) = 0, y(0) = -5], [x(0) = 1, y(0) = 0], [x(0) = 2, y(0) = 0], [x(0) = 3, y(0) = 0], [x(0) = 4, y(0) = 0], [x(0) = 5, y(0) = 0]$

> $DEplot([sist], [x(t), y(t)], t = -5..5, x = -6..6, y = -6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> $eq1 := diff(x(t), t) = -x(t) - y(t)$

$$eq1 := \frac{d}{dt}\, x(t) = -x(t) - y(t) \quad \textbf{(39)}$$

> $eq2 := diff(y(t), t) = x(t) - 3 \cdot y(t)$

$$eq2 := \frac{d}{dt}\, y(t) = x(t) - 3\, y(t) \quad \textbf{(40)}$$

> $sist := eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = -x(t) - y(t), \frac{d}{dt}\, y(t) = x(t) - 3\, y(t) \quad \textbf{(41)}$$

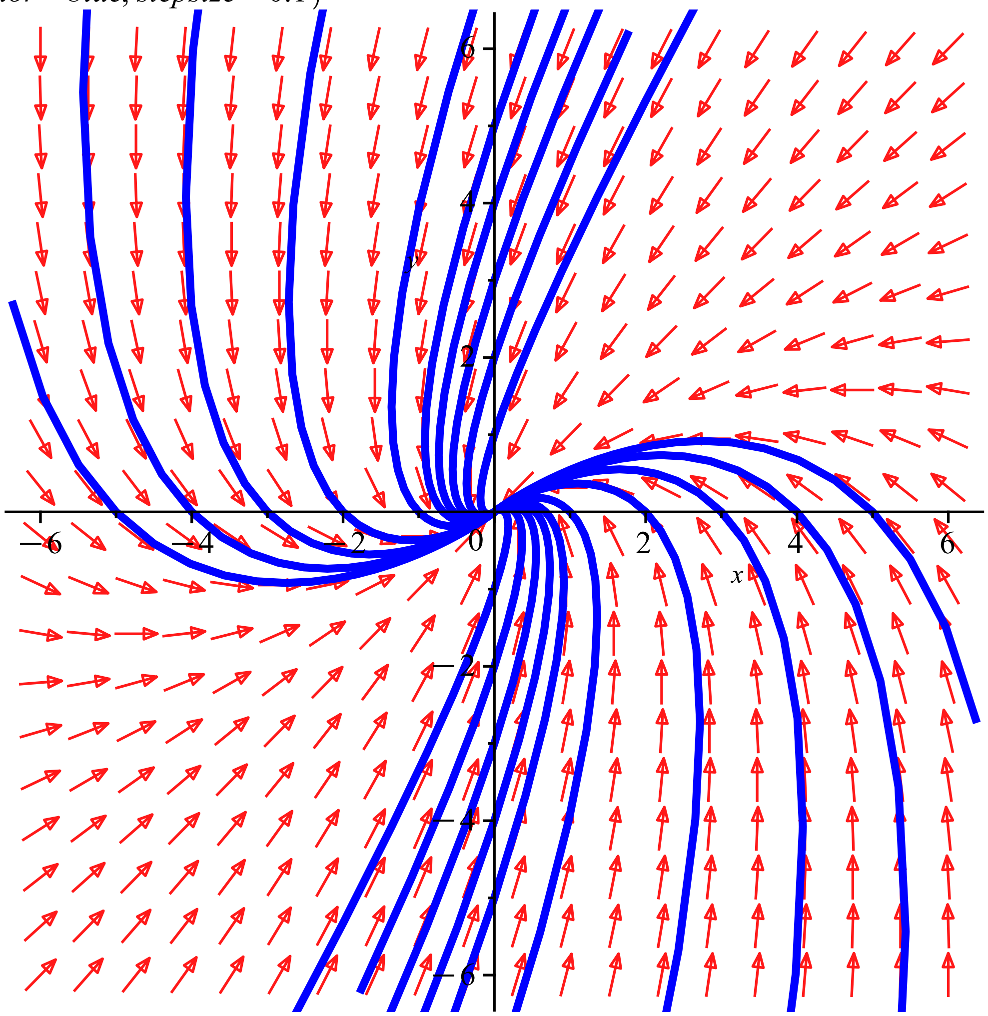
> $A := matrix([[-1, -1], [1, -3]])$

$$A := \begin{bmatrix} -1 & -1 \\ 1 & -3 \end{bmatrix} \tag{42}$$

> *eigenvals*(A)

$$-2,\ -2 \tag{43}$$

> *DEplot*$([sist], [x(t), y(t)], t=-5..5, x=-6..6, y=-6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> *eq1* $:= diff(x(t), t) = -2 \cdot x(t)$

$$eq1 := \frac{d}{dt}\, x(t) = -2\, x(t) \tag{44}$$

> *eq2* $:= diff(y(t), t) = -4 \cdot x(t) - 2 \cdot y(t)$

$$eq2 := \frac{d}{dt}\, y(t) = -4\, x(t) - 2\, y(t) \tag{45}$$

> *sist* $:= eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = -2\, x(t),\ \frac{d}{dt}\, y(t) = -4\, x(t) - 2\, y(t) \tag{46}$$

> $A := matrix([[-2, 0], [-4, -2]])$

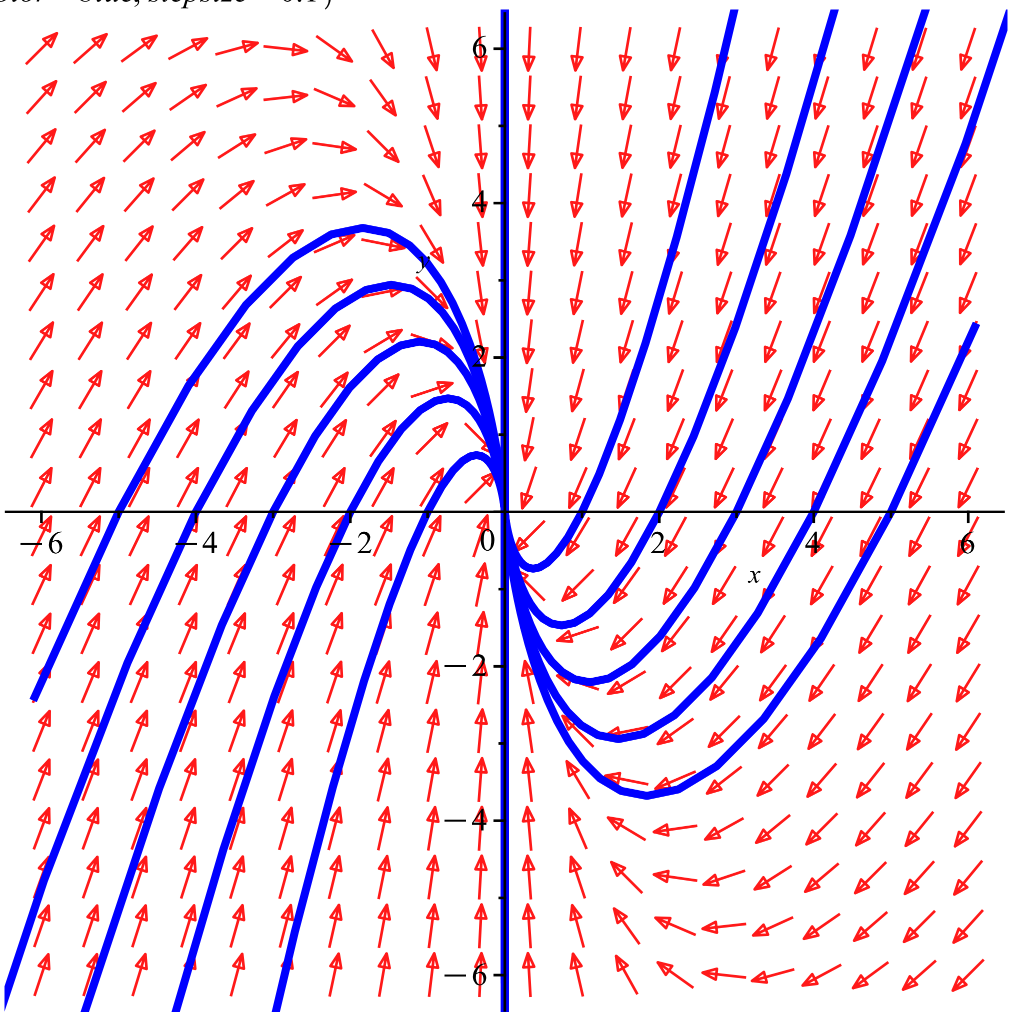
(47)

$$A := \begin{bmatrix} -2 & 0 \\ -4 & -2 \end{bmatrix} \quad (47)$$

> *eigenvals*(*A*)

$$-2, -2 \quad (48)$$

> *DEplot*([*sist*], [*x*(*t*), *y*(*t*)], *t* = −5 ..5, *x* = −6 ..6, *y* = −6 ..6, [*in_cond*], *arrows* = *medium*, *linecolor* = *blue*, *stepsize* = 0.1)



>

> *eq1* := *diff*(*x*(*t*), *t*) = *x*(*t*) + 4·*y*(*t*)

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t) + 4\, y(t) \quad (49)$$

> *eq2* := *diff*(*y*(*t*), *t*) = *x*(*t*) + *y*(*t*)

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = x(t) + y(t) \quad (50)$$

> *sist* := *eq1*, *eq2*

$$sist := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t) + 4\, y(t), \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = x(t) + y(t) \quad (51)$$

> *A* := *matrix*([[1, 4], [1, 1]])

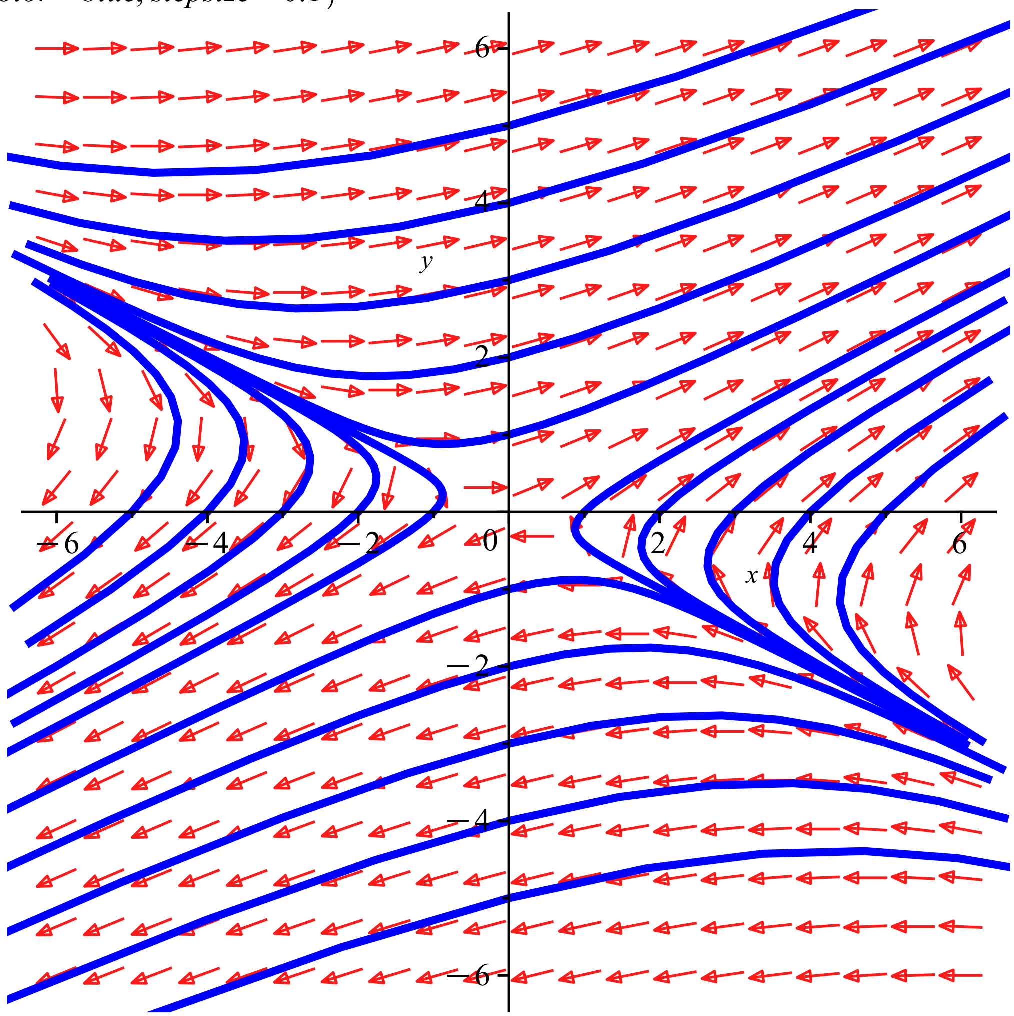
(52)

$$A := \begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix} \tag{52}$$

> *eigenvals*(A)

$$3, -1 \tag{53}$$

> *DEplot*$([sist], [x(t), y(t)], t = -5..5, x = -6..6, y = -6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> $eq1 := diff(x(t), t) = 2 \cdot x(t) - y(t)$

$$eq1 := \frac{d}{dt}\, x(t) = 2\, x(t) - y(t) \tag{54}$$

> $eq2 := diff(y(t), t) = x(t) + 2 \cdot y(t)$

$$eq2 := \frac{d}{dt}\, y(t) = x(t) + 2\, y(t) \tag{55}$$

> $sist := eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = 2\, x(t) - y(t), \ \frac{d}{dt}\, y(t) = x(t) + 2\, y(t) \tag{56}$$

> $A := matrix([[2, -1], [1, 2]])$

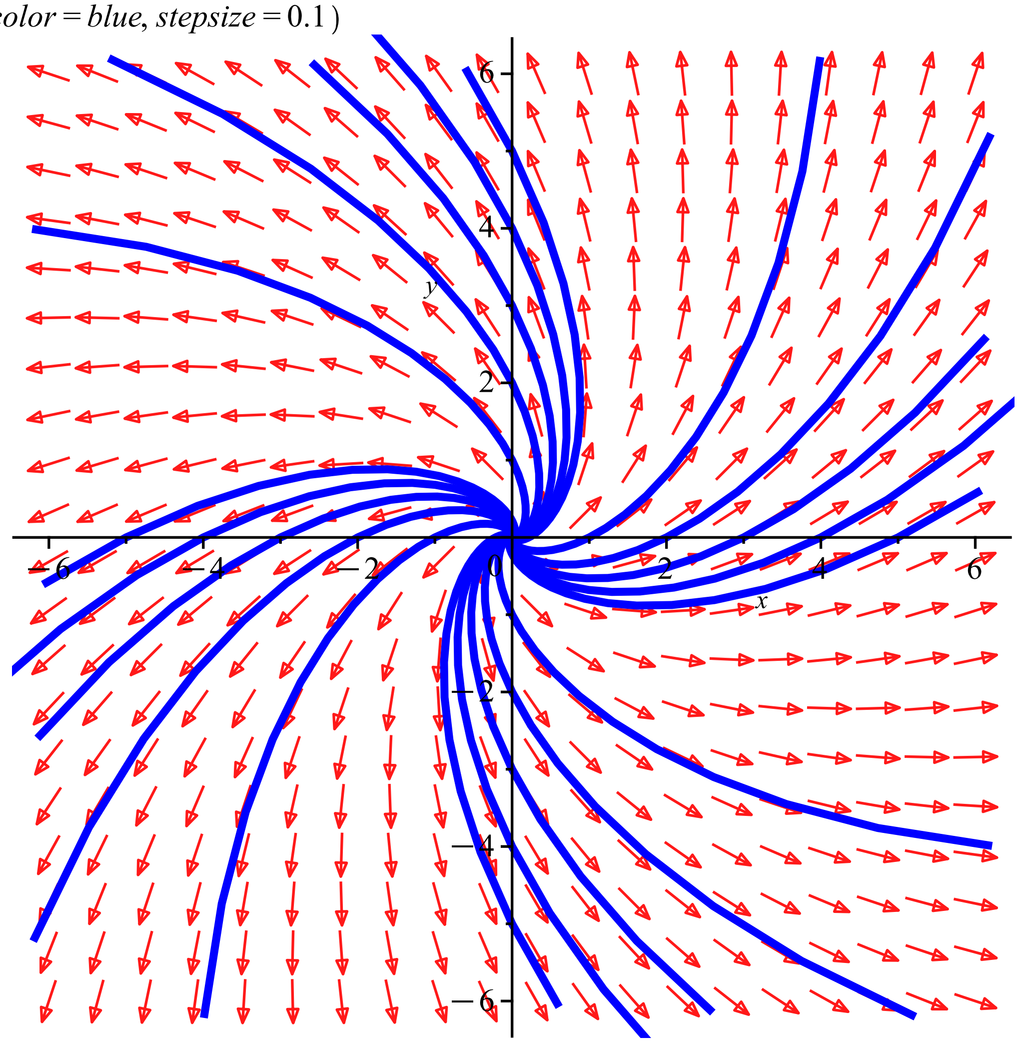
(57)

$$A := \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix} \tag{57}$$

> $eigenvals(A)$

$$2 + \mathrm{I}, 2 - \mathrm{I} \tag{58}$$

> $DEplot([sist], [x(t), y(t)], t = -5..5, x = -6..6, y = -6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> $eq1 := diff(x(t), t) = -y(t)$

$$eq1 := \frac{d}{dt}\, x(t) = -y(t) \tag{59}$$

> $eq2 := diff(y(t), t) = x(t)$

$$eq2 := \frac{d}{dt}\, y(t) = x(t) \tag{60}$$

> $sist := eq1, eq2$

$$sist := \frac{d}{dt}\, x(t) = -y(t), \frac{d}{dt}\, y(t) = x(t) \tag{61}$$

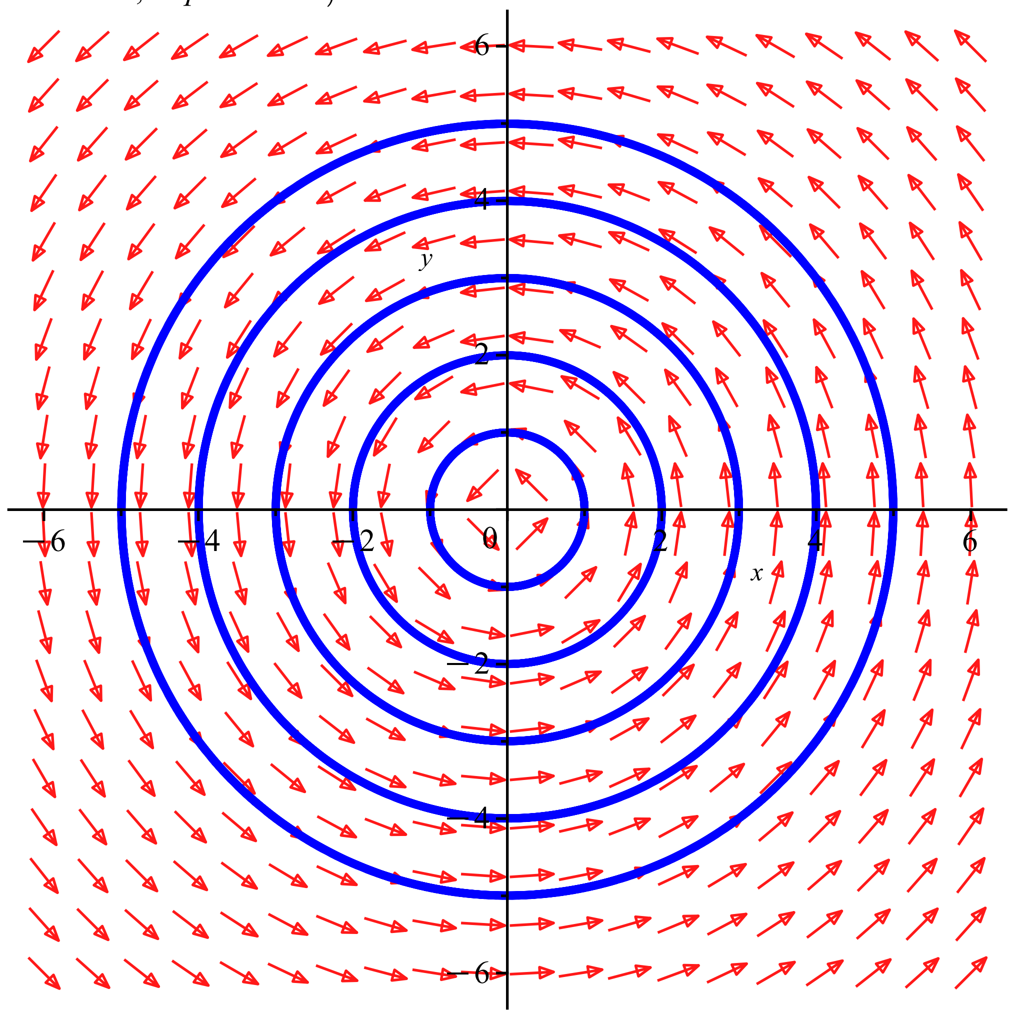
> $A := matrix([[0, -1], [1, 0]])$

$$A := \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \tag{62}$$

> $eigenvals(A)$

$$\mathrm{I},\ -\mathrm{I} \tag{63}$$

> $DEplot([sist], [x(t), y(t)], t = -5..5, x = -6..6, y = -6..6, [in\_cond], arrows = medium, linecolor = blue, stepsize = 0.1)$



>

> $eq1 := diff(x(t), t) = x(t) - 4 \cdot y(t)$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t) - 4\, y(t) \tag{64}$$

> $eq2 := diff(y(t), t) = 5 \cdot x(t) - 3 \cdot y(t)$

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = 5\, x(t) - 3\, y(t) \tag{65}$$

> $sist := eq1, eq2$

$$sist := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t) - 4\, y(t),\ \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = 5\, x(t) - 3\, y(t) \tag{66}$$

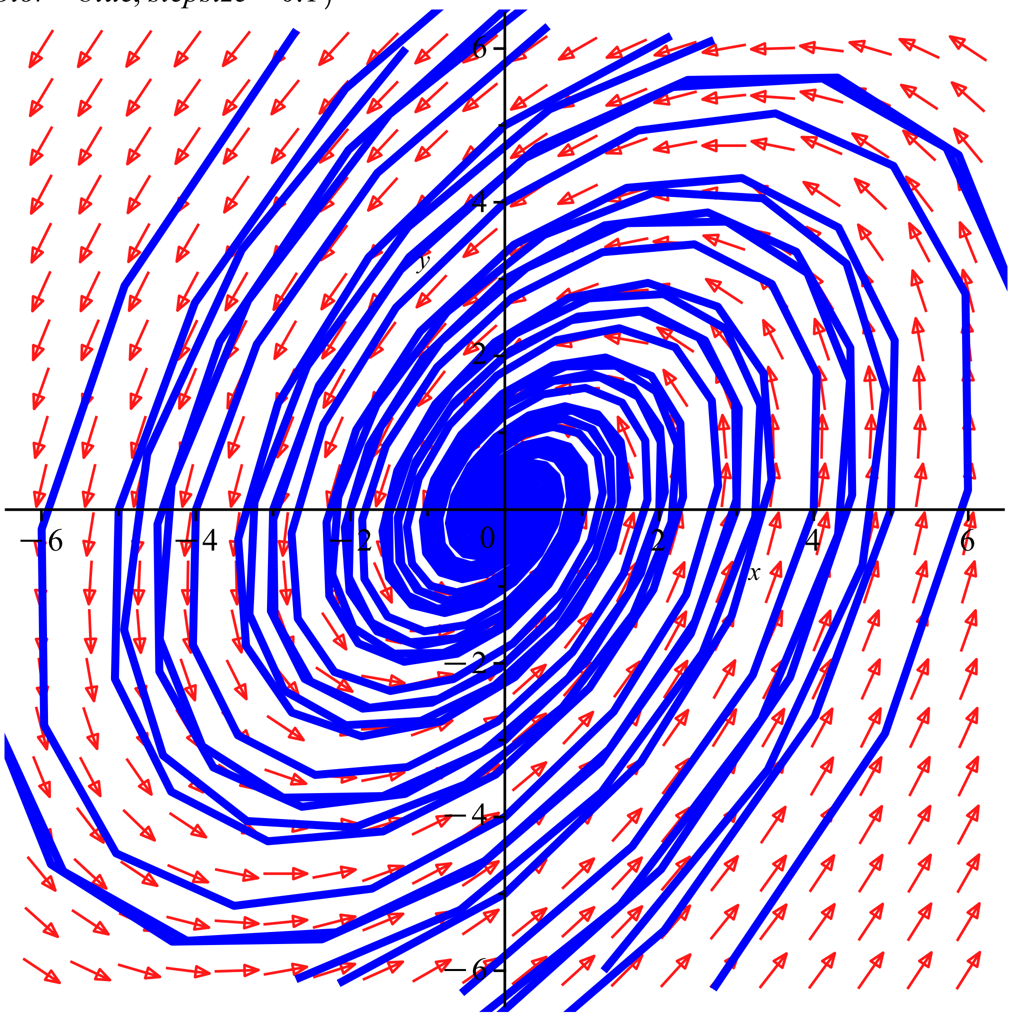
> $A := matrix([[1, -4], [5, -3]])$

$$A := \begin{bmatrix} 1 & -4 \\ 5 & -3 \end{bmatrix} \tag{67}$$

> eigenvals(A)

$$-1 + 4\,\mathrm{I},\ -1 - 4\,\mathrm{I} \tag{68}$$

> DEplot([sist], [x(t), y(t)], t = -5 ..5, x = -6 ..6, y = -6 ..6, [in_cond], arrows = medium, linecolor = blue, stepsize = 0.1)



>

> f1 := (x, y)→y

$$f1 := (x, y) \mapsto y \tag{69}$$

> f2 := (x, y)→x·(1 − x^2) + y

$$f2 := (x, y) \mapsto x\cdot\left(1 - x^2\right) + y \tag{70}$$

> eq1 := diff(x(t), t) = f1(x(t), y(t))

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = y(t) \tag{71}$$

> eq2 := diff(y(t), t) = f2(x(t), y(t))

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = x(t)\,\left(1 - x(t)^2\right) + y(t) \tag{72}$$

> $sist2 := eq1, eq2$

$$sist2 := \frac{d}{dt}\, x(t) = y(t),\ \frac{d}{dt}\, y(t) = x(t)\,\left(1 - x(t)^2\right) + y(t) \tag{73}$$

> $EquiP := solve(\{f1(x, y) = 0, f2(x, y) = 0\}, \{x, y\})$

$$EquiP := \{x = 0, y = 0\}, \{x = 1, y = 0\}, \{x = -1, y = 0\} \tag{74}$$

> $EquiP[1, 1]$

$$x = 0 \tag{75}$$

> $EquiP[1, 2]$

$$y = 0 \tag{76}$$

> $J := jacobian([f1(x, y), f2(x, y)], [x, y])$

$$J := \begin{bmatrix} 0 & 1 \\ -3\,x^2 + 1 & 1 \end{bmatrix} \tag{77}$$

> $A1 := subs(EquiP[1, 1], EquiP[1, 2], y = 0, eval(J))$

$$A1 := \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \tag{78}$$

> $eigenvals(A1)$

$$\frac{1}{2} + \frac{\sqrt{5}}{2},\ \frac{1}{2} - \frac{\sqrt{5}}{2} \tag{79}$$

> $A2 := subs(EquiP[2, 1], EquiP[2, 2], eval(J))$

$$A2 := \begin{bmatrix} 0 & 1 \\ -2 & 1 \end{bmatrix} \tag{80}$$

> $eigenvals(A2)$

$$\frac{1}{2} + \frac{I\sqrt{7}}{2},\ \frac{1}{2} - \frac{I\sqrt{7}}{2} \tag{81}$$

> $A3 := subs(EquiP[3, 1], EquiP[3, 2], eval(J))$

$$A3 := \begin{bmatrix} 0 & 1 \\ -2 & 1 \end{bmatrix} \tag{82}$$

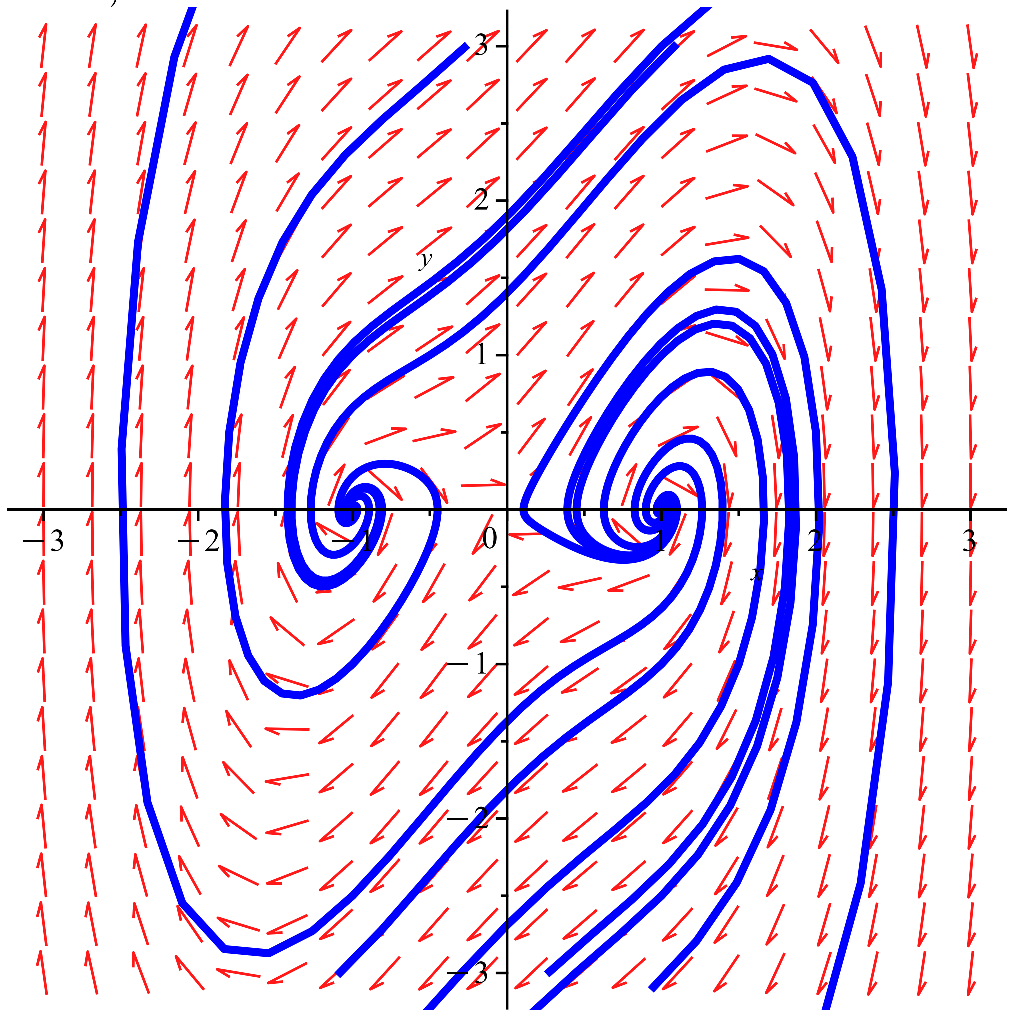
> $eigenvals(A3)$

$$\frac{1}{2} + \frac{I\sqrt{7}}{2},\ \frac{1}{2} - \frac{I\sqrt{7}}{2} \tag{83}$$

> $condin := [x(0) = -1, y(0) = 1], [x(0) = -0.5, y(0) = 1], [x(0) = 1, y(0) = 1], [x(0) = 1, y(0) = 3], [x(0) = 2, y(0) = 0.5], [x(0) = -1, y(0) = -1], [x(0) = -0.5, y(0) = 1], [x(0) = -1, y(0) = -2.5], [x(0) = 1, y(0) = -1], [x(0) = 1.5, y(0) = -1], [x(0) = 1, y(0) = -2.5];$

$$condin := [x(0) = -1, y(0) = 1], [x(0) = -0.5, y(0) = 1], [x(0) = 1, y(0) = 1], [x(0) = 1, y(0) = 3], [x(0) = 2, y(0) = 0.5], [x(0) = -1, y(0) = -1], [x(0) = -0.5, y(0) = 1], [x(0) = -1, y(0) = -2.5], [x(0) = 1, y(0) = -1], [x(0) = 1.5, y(0) = -1], [x(0) = 1, y(0) = -2.5] \tag{84}$$

> $DEplot([sist2], [x(t), y(t)], t=-10..10, x=-3..3, y=-3..3, [condin], linecolor=blue, stepsize=0.1)$



>

> $f1 := (x, y) \rightarrow -2 \cdot x + y + 2$

$$f1 := (x, y) \mapsto -2 \cdot x + y + 2 \tag{85}$$

> $f2 := (x, y) \rightarrow x \cdot y$

$$f2 := (x, y) \mapsto y \cdot x \tag{86}$$

> $eq1 := diff(x(t), t) = f1(x(t), y(t))$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = -2\, x(t) + y(t) + 2 \tag{87}$$

> $eq2 := diff(y(t), t) = f2(x(t), y(t))$

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) \tag{88}$$

> $sist2 := eq1, eq2$

$$sist2 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = -2\, x(t) + y(t) + 2, \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) \tag{89}$$

> $EquiP := solve(\{f1(x, y) = 0, f2(x, y) = 0\}, \{x, y\})$

$$EquiP := \{x = 0, y = 0\} \tag{90}$$

> $J := jacobian([f1(x,y), f2(x,y)], [x,y])$

$$J := \begin{bmatrix} 0 & 2y \\ 1 & 0 \end{bmatrix} \tag{91}$$

> $A1 := subs(EquiP[1], EquiP[2], eval(J))$

$$A1 := \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \tag{92}$$

> $f1 := (x,y) \to y^2$

$$f1 := (x,y) \mapsto y^2 \tag{93}$$

> $f2 := (x,y) \to x$

$$f2 := (x,y) \mapsto x \tag{94}$$

> $eq1 := diff(x(t), t) = f1(x(t), y(t))$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = y(t)^2 \tag{95}$$

> $eq2 := diff(y(t), t) = f2(x(t), y(t))$

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = x(t) \tag{96}$$

> $sist2 := eq1, eq2$

$$sist2 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = y(t)^2, \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = x(t) \tag{97}$$

> $EquiP := solve(\{f1(x,y) = 0, f2(x,y) = 0\}, \{x, y\})$

$$EquiP := \{x = 0, y = 0\} \tag{98}$$

> $J := jacobian([f1(x,y), f2(x,y)], [x,y])$

$$J := \begin{bmatrix} 0 & 2y \\ 1 & 0 \end{bmatrix} \tag{99}$$

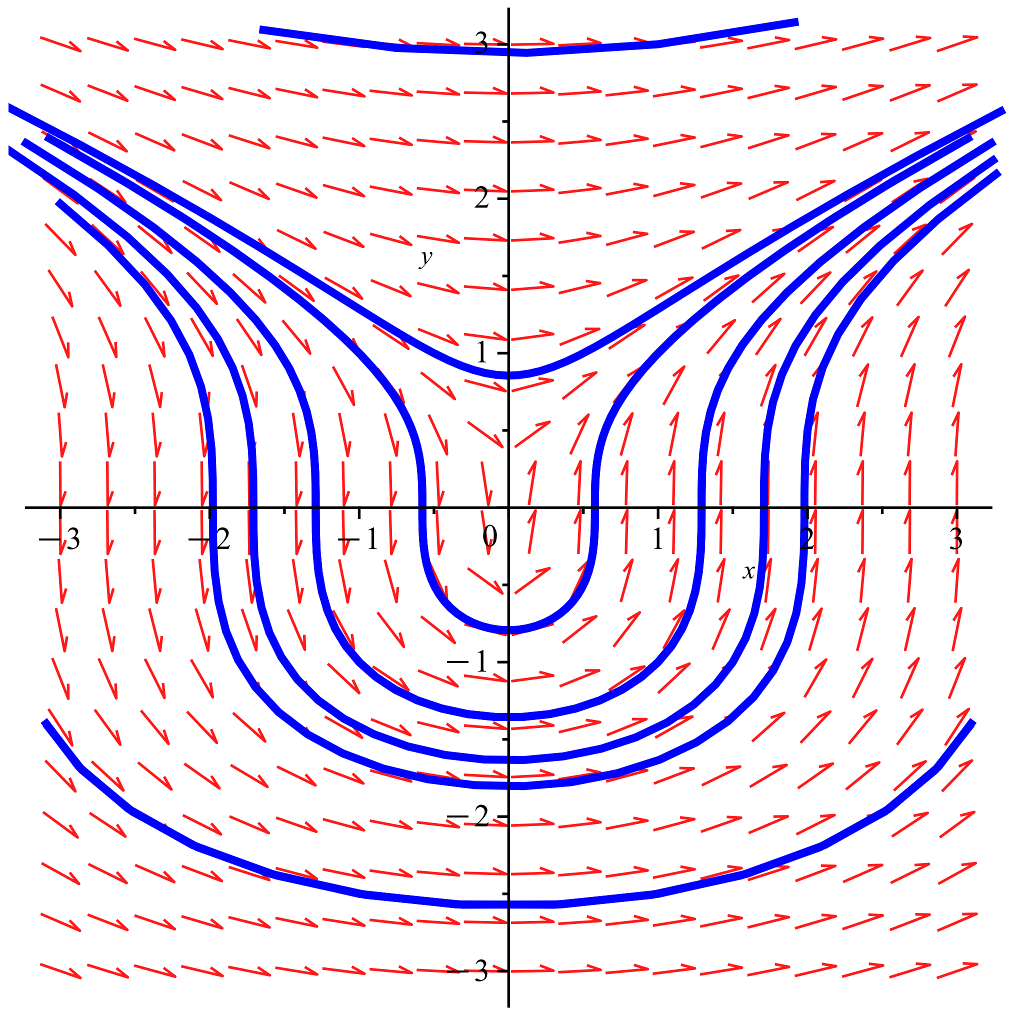
> $A1 := subs(EquiP[1], EquiP[2], eval(J))$

$$A1 := \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \tag{100}$$

> $eigenvals(A1)$

$$0, 0 \tag{101}$$

> $DEplot([sist2], [x(t), y(t)], t = -10..10, x = -3..3, y = -3..3, [condin], linecolor = blue, stepsize = 0.1)$



>

> $f1 := (x, y) \rightarrow -2 \cdot x + y + 2$

$$f1 := (x, y) \mapsto -2 \cdot x + y + 2 \quad \textbf{(102)}$$

> $f2 := (x, y) \rightarrow x \cdot y$

$$f2 := (x, y) \mapsto y \cdot x \quad \textbf{(103)}$$

> $eq1 := diff(x(t), t) = f1(x(t), y(t))$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = -2\, x(t) + y(t) + 2 \quad \textbf{(104)}$$

> $eq2 := diff(y(t), t) = f2(x(t), y(t))$

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) \quad \textbf{(105)}$$

> $sist2 := eq1, eq2$

$$sist2 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = -2\, x(t) + y(t) + 2,\ \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) \quad \textbf{(106)}$$

> $EquiP := solve(\{f1(x, y) = 0, f2(x, y) = 0\}, \{x, y\})$

$$EquiP := \{x = 1, y = 0\}, \{x = 0, y = -2\} \quad \textbf{(107)}$$

> $J := jacobian([f1(x, y), f2(x, y)], [x, y])$

$$J := \begin{bmatrix} -2 & 1 \\ y & x \end{bmatrix} \quad \textbf{(108)}$$

> $A1 := subs(EquiP[1,1], EquiP[1,2], eval(J))$

$$A1 := \begin{bmatrix} -2 & 1 \\ 0 & 1 \end{bmatrix} \quad \textbf{(109)}$$

> $eigenvals(A1)$

$$-2, 1 \quad \textbf{(110)}$$

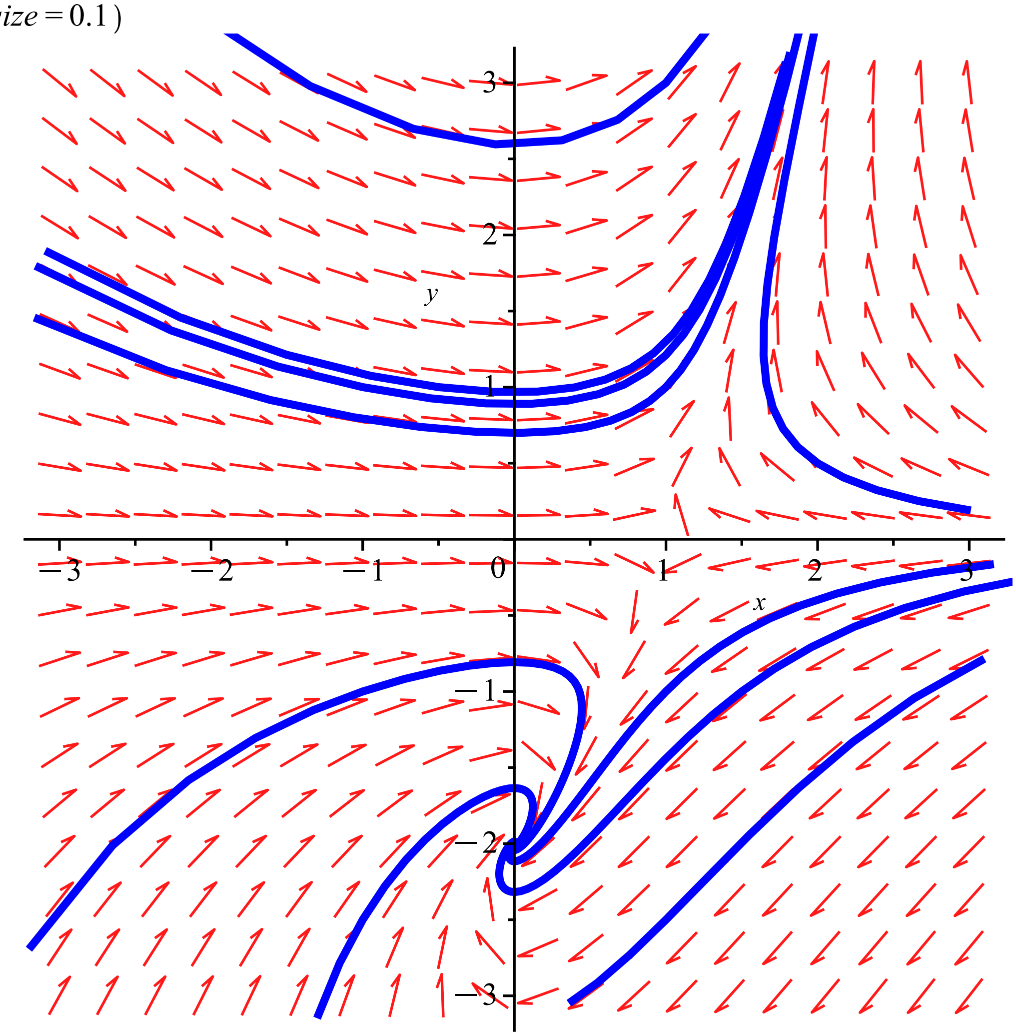
> $A2 := subs(EquiP[2,1], EquiP[2,2], eval(J))$

$$A2 := \begin{bmatrix} -2 & 1 \\ -2 & 0 \end{bmatrix} \quad \textbf{(111)}$$

> $eigenvals(A2)$

$$-1 + \mathrm{I}, -1 - \mathrm{I} \quad \textbf{(112)}$$

> $DEplot([sist2], [x(t), y(t)], t = -10..10, x = -3..3, y = -3..3, [condin], linecolor = blue, stepsize = 0.1)$



>

> $f1 := (x, y) \rightarrow x^2 - y^2$

(113)

$$f1 := (x,y) \mapsto x^2 - y^2 \quad \textbf{(113)}$$

```
> f2 := (x,y)→x·y − 1
```

$$f2 := (x,y) \mapsto y \cdot x - 1 \quad \textbf{(114)}$$

```
> eq1 := diff(x(t), t) = f1(x(t), y(t))
```

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t)^2 - y(t)^2 \quad \textbf{(115)}$$

```
> eq2 := diff(y(t), t) = f2(x(t), y(t))
```

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) - 1 \quad \textbf{(116)}$$

```
> sist2 := eq1, eq2
```

$$sist2 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = x(t)^2 - y(t)^2,\ \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = y(t)\, x(t) - 1 \quad \textbf{(117)}$$

```
> EquiP := solve({f1(x, y) = 0, f2(x, y) = 0}, {x, y})
```

$$EquiP := \{x = -RootOf(\_Z^2+1),\ y = RootOf(\_Z^2+1)\},\ \{x=1,\ y=1\},\ \{x=-1,\ y=-1\} \quad \textbf{(118)}$$

```
> J := jacobian([f1(x, y), f2(x, y)], [x, y])
```

$$J := \begin{bmatrix} 2\,x & -2\,y \\ y & x \end{bmatrix} \quad \textbf{(119)}$$

```
> A1 := subs(EquiP[1, 1], EquiP[1, 2], eval(J))
```

$$A1 := \begin{bmatrix} -2\,RootOf(\_Z^2+1) & -2\,RootOf(\_Z^2+1) \\ RootOf(\_Z^2+1) & -RootOf(\_Z^2+1) \end{bmatrix} \quad \textbf{(120)}$$

```
> eigenvals(A1)
```

$$RootOf(3\,RootOf(\_Z^2+1)\,\_Z + \_Z^2 - 4) \quad \textbf{(121)}$$

```
> A2 := subs(EquiP[2, 1], EquiP[2, 2], eval(J))
```

$$A2 := \begin{bmatrix} 2 & -2 \\ 1 & 1 \end{bmatrix} \quad \textbf{(122)}$$

```
> eigenvals(A2)
```

$$\frac{3}{2} + \frac{\mathrm{I}\sqrt{7}}{2},\ \frac{3}{2} - \frac{\mathrm{I}\sqrt{7}}{2} \quad \textbf{(123)}$$

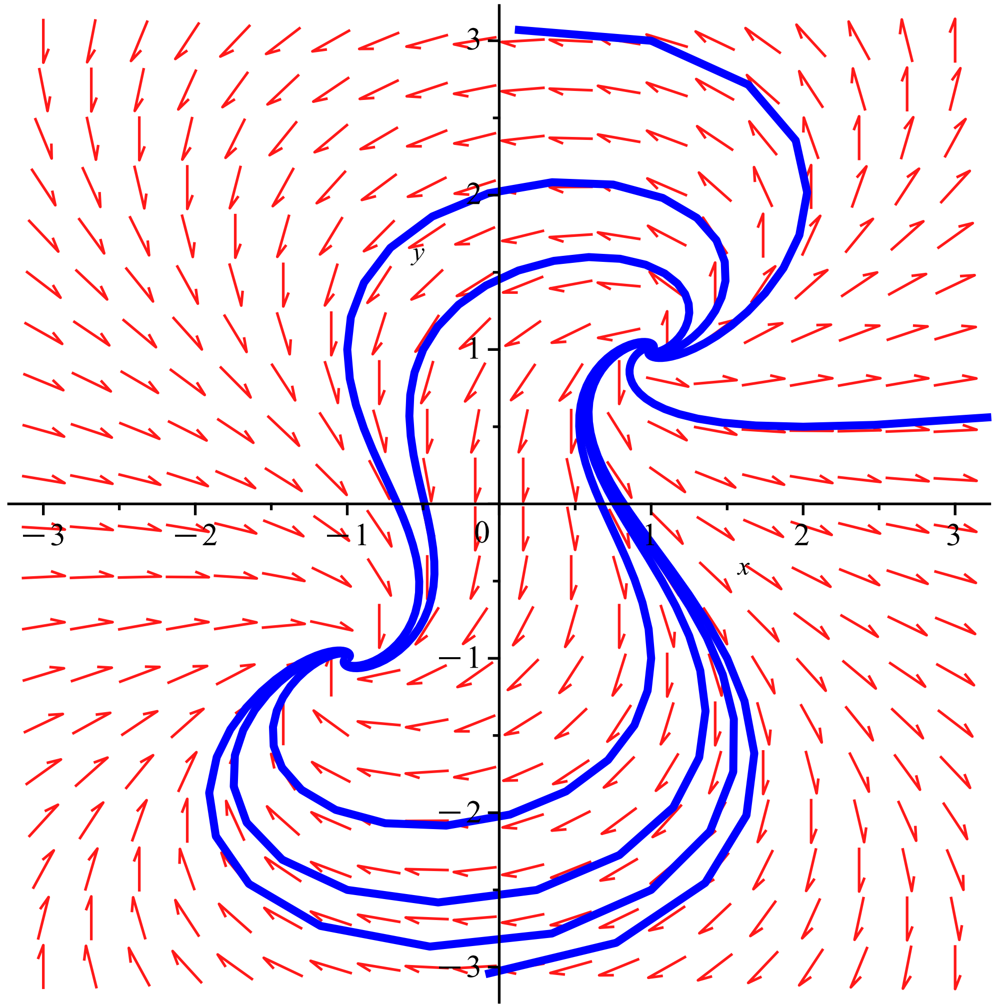
```
> A3 := subs(EquiP[3, 1], EquiP[3, 2], eval(J))
```

$$A3 := \begin{bmatrix} -2 & 2 \\ -1 & -1 \end{bmatrix} \quad \textbf{(124)}$$

```
> eigenvals(A3)
```

$$-\frac{3}{2} + \frac{\mathrm{I}\sqrt{7}}{2},\ -\frac{3}{2} - \frac{\mathrm{I}\sqrt{7}}{2} \quad \textbf{(125)}$$

```
> DEplot([sist2], [x(t), y(t)], t=−10..10, x=−3..3, y=−3..3, [condin], linecolor=blue,
    stepsize=0.1)
```



>

> $f1 := (x, y) \rightarrow 2 \cdot x - 1.2 \cdot x \cdot y$

$$f1 := (x, y) \mapsto 2 \cdot x + (-1) \cdot 1.2 \cdot x \cdot y \tag{126}$$

> $f2 := (x, y) \rightarrow -y + 0.9 \cdot x \cdot y$

$$f2 := (x, y) \mapsto -y + 0.9 \cdot x \cdot y \tag{127}$$

> $eq1 := diff(x(t), t) = f1(x(t), y(t))$

$$eq1 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = 2\, x(t) - 1.2\, y(t)\, x(t) \tag{128}$$

> $eq2 := diff(y(t), t) = f2(x(t), y(t))$

$$eq2 := \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = -y(t) + 0.9\, y(t)\, x(t) \tag{129}$$

> $sist := eq1, eq2$

$$sist := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = 2\, x(t) - 1.2\, y(t)\, x(t),\ \frac{\mathrm{d}}{\mathrm{d}t}\, y(t) = -y(t) + 0.9\, y(t)\, x(t) \tag{130}$$

> $in\_cond := x(0) = 0.5, y(0) = 2$

$$in\_cond := x(0) = 0.5, y(0) = 2 \tag{131}$$

> $sol := dsolve(\{sist, in\_cond\}, \{x(t), y(t)\})$

$$sol := \left\{ x(t) = RootOf\left(-2 \left(\right. \right. \right. \tag{132}$$

$$\int_{\_a}^{\_Z}$$

$$\left(\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)}\,(-1)^{\_Z2\sim}\right)$$

$$\Bigg/ \left(\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z \left(5\, \mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\ \_Z\, (-1)^{\_Z2\sim}}{2\, \mathrm{e}^{\frac{31}{40}}} \right) + 6 \right) \right) \mathrm{e}^{\frac{9\ \_f}{20}} \sqrt{\_f} \right.$$

$$+\,2\,\_f\,\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\,\mathit{RootOf}\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\ (-1)^{\_Z2\sim}}\right)}\,(-1)^{\_Z2\sim}\Bigg)$$

$$\mathrm{d}\_f\Bigg) + \int_{\_a}^{\frac{1}{2}} 1 \Bigg/ \Bigg(\_f\Bigg(\mathrm{LambertW}\Bigg(\_Z4\sim,$$

$$\left.\left.\left.\frac{RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\frac{\sqrt{2}\,\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\_f}{20}}}{2\,\mathrm{e}\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)+1\right)\right)\mathrm{d}\_f+2\,t\right),$$

$$y(t) = -\left(5\,\mathrm{e}^{-1}\,\mathit{RootOf}\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)\right.\right.\right.$$

$$+ 6\Big)\Big)$$

$$e^{\frac{1}{20}\left(9\,RootOf\left(-2\left(\right.\right.\right.}$$

$$\int_{\_a}^{\_Z} \left(\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\, RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\ (-1)^{\_Z2\sim}}\right)\,(-1)^{\_Z2\sim}} \right) \Big/$$

$$\left(\mathrm{e}^{-1}\, RootOf\left(\_Z \left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\;\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}} \right) + 6 \right) \right) \mathrm{e}^{\frac{9\,\_f}{20}} \sqrt{\_f} \right.$$

$$+ 2\_f\, \mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z\left(5\, \mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)_{-}^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right) + 6\right)\right)\mathrm{e}^{\frac{9\_f}{20}}}{2\sqrt{\_f}\ (-1)_{-}^{\_Z2\sim}}\right)(-1)_{-}^{\_Z2\sim}}\right)\mathrm{d}\_f\Bigg)$$

$$+\int_{\_a}^{\frac{1}{2}} \frac{1}{\_f\left(\mathrm{LambertW}\left(\_Z4\sim, \frac{RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\,\mathrm{e}\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)+1\right)}\,\mathrm{d}\_f + 2\,t\right)\right)\right)$$

$$\left(6 \left(RootOf\left(-2 \left(\right.\right.\right.\right.$$

$$\int_{\_a}^{\_Z}$$

$$\left(\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\_f}{20}}}{2\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)}\,(-1)^{\_Z2\sim}\right)$$

$$\Bigg/ \left(\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z \left(5\, \mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\ \_Z\, (-1)^{\_Z2\sim}}{2\, \mathrm{e}^{\frac{31}{40}}} \right) + 6 \right) \right) \mathrm{e}^{\frac{9\,\_f}{20}} \sqrt{\_f}$$

$$+ 2\,\_f\, \mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\, RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\ (-1)^{\_Z2\sim}}\right)}\,(-1)^{\_Z2\sim}\Bigg)$$

$$\left.\mathrm{d}\_f\right) + \int_{\_a}^{\frac{1}{2}} 1 \Bigg/ \left(\_f\left(\mathrm{LambertW}\left(\_Z4\sim,\right.\right.\right.$$

$$\frac{RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\;\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\_f}{20}}}{2\,\mathrm{e}\sqrt{\_f}\,(-1)^{\_Z2\sim}}\Bigg)+1\Bigg)\Bigg)\,\mathrm{d}\_f+2\,t\Bigg)\Bigg)$$

1/2

$$\mathrm{LambertW}\left(\_Z4\sim, \left(\mathrm{e}^{-1}\,RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\;\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)\right.\right.\right.\right.\right.$$

e

$$+ 6\Big)\Big)$$

$$\mathrm{e}^{\frac{1}{20}\left(9\,RootOf\left(-2\left(\right.\right.\right.}$$

$$\int_{\_a}^{\_Z} \left(e^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{e^{-1}\, RootOf\left(\_Z \left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\ \_Z\,(-1)^{\_Z2\sim}}{2\, e^{\frac{31}{40}}}\right)+6\right)\right) e^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\ (-1)^{\_Z2\sim}}\right)} (-1)^{\_Z2\sim} \right) \Big/$$

$$\left(e^{-1}\, RootOf\left(\_Z \left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\;\_Z\,(-1)^{\_Z2\sim}}{2\,e^{\frac{31}{40}}}\right) + 6\right)\right) e^{\frac{9\,\_f}{20}} \sqrt{\_f}\right.$$

$$+\, 2\,\_f\,\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\,\mathit{RootOf}\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\,\_Z\,(-1)_{-}^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\,(-1)_{-}^{\_Z2\sim}}\right)(-1)_{-}^{\_Z2\sim}}\right)\,\mathrm{d}\_f\Bigg)$$

$$+\int_{\_a}^{\frac{1}{2}} \frac{1}{\_f\left(\mathrm{LambertW}\left(\_Z4\sim, \frac{RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\,\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\,\mathrm{e}\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)+1\right)}\,\mathrm{d}\_f+2\,t\left.\right)\left.\right)\left.\right)$$

$$\Bigg(2\,\Bigg(RootOf\Bigg(-2\,\Bigg($$

$$\int_{\_a}^{\_Z}\left(\mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\mathrm{e}^{-1}\,RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim,\ \frac{\sqrt{2}\,\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\,(-1)^{\_Z2\sim}}\right)}(-1)^{\_Z2\sim}\right)\Bigg/$$

$$\left(\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z \left(5\, \mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\; \_Z\, (-1)^{\_Z2\sim}}{2\, \mathrm{e}^{\frac{31}{40}}}\right) + 6\right)\right) \mathrm{e}^{\frac{9\,\_f}{20}}\, \sqrt{\_f} + 2\,\_f\, \mathrm{e}^{\mathrm{LambertW}\left(\_Z4\sim, \frac{\mathrm{e}^{-1}\, \mathit{RootOf}\left(\_Z \left(5\, \mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\; \_Z\, (-1)^{\_Z2\sim}}{2\, \mathrm{e}^{\frac{31}{40}}}\right) + 6\right)\right) \mathrm{e}^{\frac{9\,\_f}{20}}}{2\sqrt{\_f}\, (-1)^{\_Z2\sim}}\right)} (-1)^{\_Z2\sim} \right) \mathrm{d}\_f \Bigg)$$

$$+\int_{\_a}^{\frac{1}{2}} \frac{1}{\_f\left(\mathrm{LambertW}\left(\_Z4\sim, \frac{RootOf\left(\_Z\left(5\,\mathrm{LambertW}\left(\_Z4\sim, \frac{\sqrt{2}\;\_Z\,(-1)^{\_Z2\sim}}{2\,\mathrm{e}^{\frac{31}{40}}}\right)+6\right)\right)\mathrm{e}^{\frac{9\,\_f}{20}}}{2\,\mathrm{e}\sqrt{\_f}\;(-1)^{\_Z2\sim}}\right)+1\right)}\,\mathrm{d}\_f + 2\,t\Bigg)\Bigg)$$

$1/2$

$$(-1)^{\_Z2\sim}\Bigg)\Bigg)$$

$$(-1)^{\_Z2\sim}\Bigg)\Bigg\}$$

\>

\> $EquiP := solve(\{f1(x, y) = 0, f2(x, y) = 0\}, \{x, y\})$

$$EquiP := \{x = 0., y = 0.\}, \{x = 1.111111111, y = 1.666666667\} \quad \textbf{(133)}$$

\> $J := jacobian([f1(x, y), f2(x, y)], [x, y])$

(134)

$$J := \begin{bmatrix} 2 - 1.2\,y & -1.2\,x \\ 0.9\,y & -1 + 0.9\,x \end{bmatrix} \quad \textbf{(134)}$$

> $A1 := subs(EquiP[1,1], EquiP[1,2], eval(J))$

$$A1 := \begin{bmatrix} 2. & -0. \\ 0. & -1. \end{bmatrix} \quad \textbf{(135)}$$

> $eigenvals(A1)$

$$-1., 2. \quad \textbf{(136)}$$

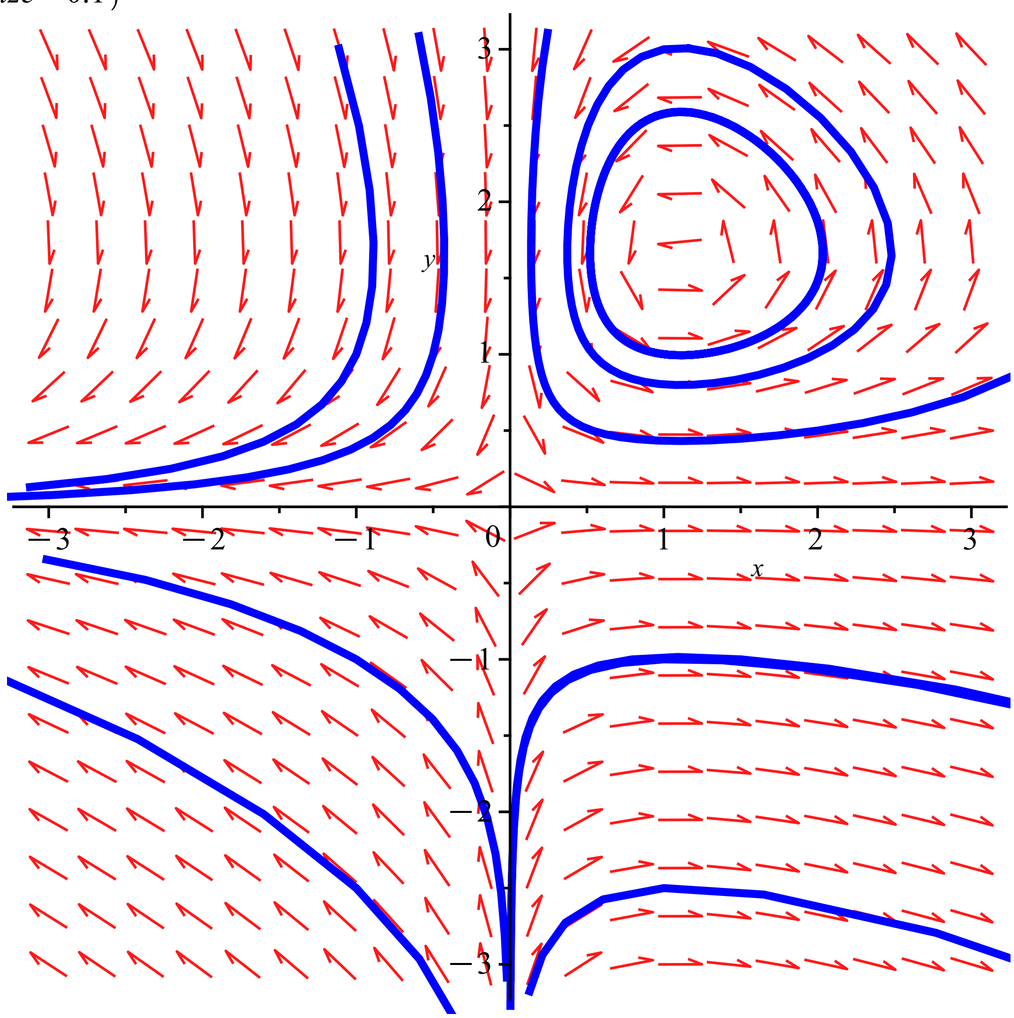
> $A2 := subs(EquiP[2,1], EquiP[2,2], eval(J))$

$$A2 := \begin{bmatrix} 0. & -1.333333333 \\ 1.500000000 & -1. \times 10^{-10} \end{bmatrix} \quad \textbf{(137)}$$

> $eigenvals(A2)$

$$-5.00000000000000 \times 10^{-11} + 1.41421356219632\,\mathrm{I}, -5.00000000000000 \times 10^{-11} - 1.41421356219632\,\mathrm{I} \quad \textbf{(138)}$$

> $DEplot([sist], [x(t), y(t)], t = -10..10, x = -3..3, y = -3..3, [condin], linecolor = blue, stepsize = 0.1)$



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