"ex1"

"ex1" (1)

$eq1 := diff(x(t), t) = x(t) + y(t) + t - 1;$

$$\frac{d}{dt} x(t) = x(t) + y(t) + t - 1 \quad (2)$$

$eq2 := diff(y(t), t) = -2 \cdot x(t) + 4 \cdot y(t) + \exp(1)^t;$

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

$dsolve(\{eq1, eq2\}, \{x(t), y(t)\});$

$$\left\{x(t) = e^{3t}\_C2 + e^{2t}\_C1 + \frac{1}{2} e^t - \frac{2}{3} t + \frac{5}{18}, y(t) = 2\,e^{3t}\_C2 + e^{2t}\_C1 + \frac{1}{18} - \frac{1}{3} t\right\} \quad (4)$$

"ex2"

"ex2" (5)

$eq1 := 'eq1';$

$$eq1 \quad (6)$$

$eq2 := 'eq2';$

$$eq2 \quad (7)$$

$eq1 := y + x^2;$

$$x^2 + y \quad (8)$$

$eq2 := -x + x \cdot y;$

$$x\,y - x \quad (9)$$

$solve(\{eq1, eq2\}, \{x, y\});$

$$\{x = 0, y = 0\}, \{x = RootOf(\_Z^2 + 1), y = 1\} \quad (10)$$

$f1 := (x, y) \rightarrow y + x^2;$

$$(x, y) \rightarrow y + x^2 \quad (11)$$

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

$$(x, y) \rightarrow -x + y\,x \quad (12)$$

$with(linalg):$
$with(VectorCalculus):$
$Jm := Jacobian([f1(x, y), f2(x, y)], [x, y]);$

$$\begin{bmatrix} 2\,x & 1 \\ y - 1 & x \end{bmatrix} \quad (13)$$

$A := subs([x = 0, y = 0], Jm);$

$$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \quad (14)$$

$eigenvalues(A);$

$$I, -I \quad (15)$$

"(0,0) is not a hyperbolic equilibrium point"

"(0,0) is not a hyperbolic equilibrium point" (16)

$eq := y^2 + x^2 + x^2 y = c$

$$x^2 y + x^2 + y^2 = c \tag{17}$$

$solve(eq, y);$

$$-\frac{1}{2} x^2 + \frac{1}{2} \sqrt{x^4 - 4 x^2 + 4 c}, -\frac{1}{2} x^2 - \frac{1}{2} \sqrt{x^4 - 4 x^2 + 4 c} \tag{18}$$

$eq3 := \int (-x + x \cdot y) \, dx = \int (y + x^2) \, dy;$

$$\frac{1}{2} x^2 y - \frac{1}{2} x^2 = x^2 y + \frac{1}{2} y^2 \tag{19}$$

$solve(eq3, y);$

$$\left(-\frac{1}{2} x + \frac{1}{2} \sqrt{x^2 - 4}\right) x, \left(-\frac{1}{2} x - \frac{1}{2} \sqrt{x^2 - 4}\right) x \tag{20}$$

$H := (x, y) \rightarrow \frac{1}{2} \cdot x^2 \cdot y + \frac{1}{2} \cdot x^2 + \frac{1}{2} \cdot y^2;$

$$(x, y) \rightarrow 1 \, \frac{1}{2} x^2 y + 1 \, \frac{1}{2} x^2 + 1 \, \frac{1}{2} y^2 \tag{21}$$

$eq := diff(H(x, y), x) \cdot (y + x^2) - diff(H(x, y), y) \cdot (-x + x \cdot y);$

$$(x y + x) (x^2 + y) - \left(\frac{1}{2} x^2 + y\right) (x y - x) \tag{22}$$

$with(DEtools);$

[*AreSimilar*, *Closure*, *DEnormal*, *DEplot*, *DEplot3d*, *DEplot_polygon*, *DFactor*, *DFactorLCLM*, *DFactorsols*, *Dchangevar*, *Desingularize*, *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*, *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*] **(23)**

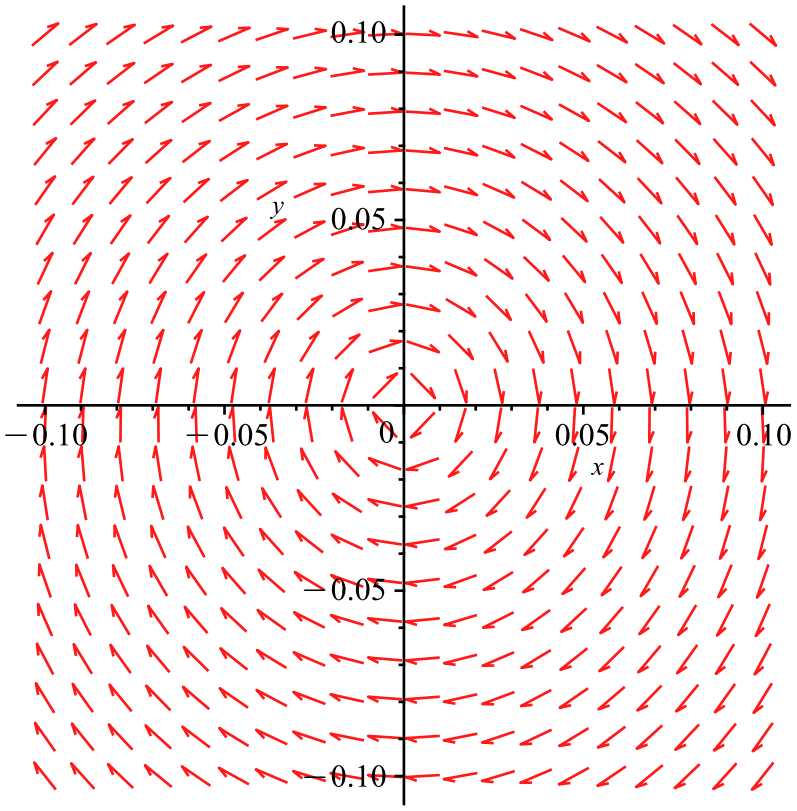
$eq1 := diff(x(t), t) = y(t) + x(t)^2;$

$$\frac{d}{dt} x(t) = y(t) + x(t)^2 \tag{24}$$

$eq2 := diff(y(t), t) = -x(t) + x(t) \cdot y(t);$

$$\frac{d}{dt} y(t) = -x(t) + x(t)\, y(t) \tag{25}$$

$dfieldplot(\{eq1, eq2\}, \{x(t), y(t)\}, t = -3 \ldots 3, x = -0.1 \ldots 0.1, y = -0.1 \ldots 0.1);$



$eq := diff(y(x), x) = \frac{(-x + x \cdot y(x))}{y(x) + x^2};$

$$\frac{d}{dx} y(x) = \frac{-x + x\, y(x)}{y(x) + x^2} \tag{26}$$

$dsolve(eq, y(x));$

$$y(x) = -\frac{1}{2} \frac{-2\_C1 - 1 + \sqrt{2\_C1\, x^2 + 2\_C1 + 1}}{\_C1}, y(x) \tag{27}$$

$$= \frac{1}{2} \frac{2\_C1 + 1 + \sqrt{2\_C1\, x^2 + 2\_C1 + 1}}{\_C1}$$