$f1 := x - 2 \cdot x \cdot y;$

$$-2\,x\,y + x \qquad \textbf{(1)}$$

$solve(f1, \{x, y\});$

$$\left\{x = x, y = \frac{1}{2}\right\}, \{x = 0, y = y\} \qquad \textbf{(2)}$$

$f2 := \frac{x^2}{2} - y;$

$$\frac{1}{2}\,x^2 - y \qquad \textbf{(3)}$$

$solve(\{f1, f2\}, \{x, y\});$

$$\{x = 0, y = 0\}, \left\{x = 1, y = \frac{1}{2}\right\}, \left\{x = -1, y = \frac{1}{2}\right\} \qquad \textbf{(4)}$$

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

$$(x, y) \rightarrow x - 2\,y\,x \qquad \textbf{(5)}$$

$f2 := (x, y) \rightarrow \frac{x^2}{2} - y;$

$$(x, y) \rightarrow \frac{1}{2}\,x^2 - y \qquad \textbf{(6)}$$

$with(linalg) :$
$with(VectorCalculus) :$

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

$$\begin{bmatrix} -2\,y + 1 & -2\,x \\ x & -1 \end{bmatrix} \qquad \textbf{(7)}$$

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

$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \qquad \textbf{(8)}$$

$eigenvalues(A);$

$$1, -1 \qquad \textbf{(9)}$$

"The linearized system"

"The linearized system" **(10)**

$eq1 := diff(x(t), t) = A[1].\langle x, y \rangle;$

$$\frac{\mathrm{d}}{\mathrm{d}t}\,x(t) = x \qquad \textbf{(11)}$$

$eq2 := diff(y(t), t) = A[2].\langle x, y \rangle;$

$$\frac{\mathrm{d}}{\mathrm{d}t}\,y(t) = -y \qquad \textbf{(12)}$$

$B := subs\left(\left[x = 1, y = \frac{1}{2}\right], Jm\right);$

$$\begin{bmatrix} 0 & -2 \\ 1 & -1 \end{bmatrix} \tag{13}$$

eigenvalues(B);

$$-\frac{1}{2} + \frac{1}{2}\,\mathrm{I}\sqrt{7}, -\frac{1}{2} - \frac{1}{2}\,\mathrm{I}\sqrt{7} \tag{14}$$

$eq1 :=' eq1'$

$$eq1 \tag{15}$$

$eq2 :=' eq2'$

$$eq2 \tag{16}$$

$eq1 := diff(x(t), t) = B[1].\langle x, y\rangle;$

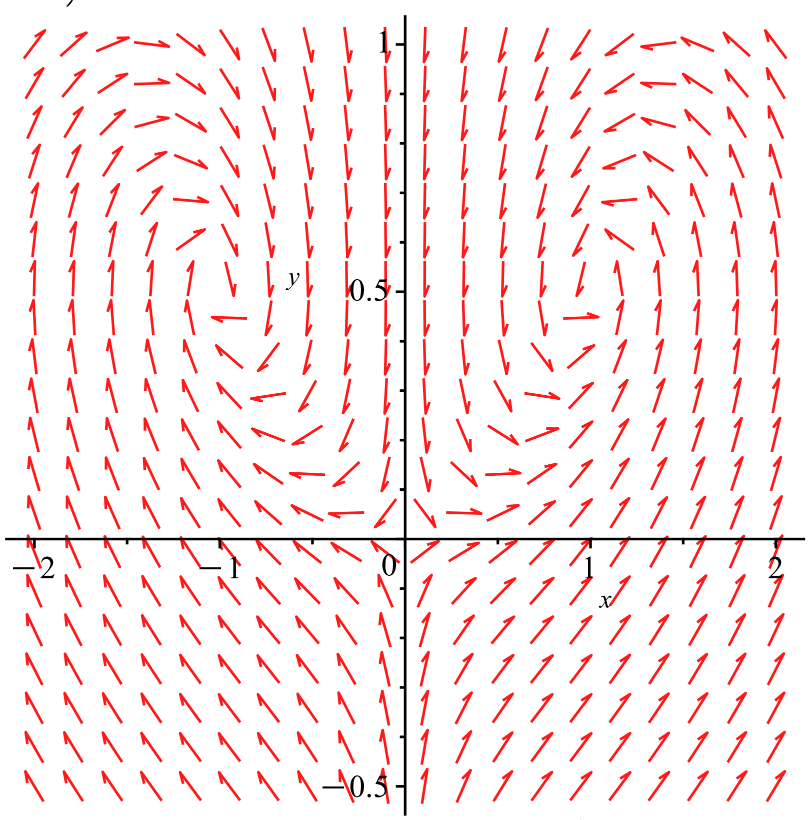
$$\frac{\mathrm{d}}{\mathrm{d}t}\,x(t) = -2\,y \tag{17}$$

$eq2 := diff(y(t), t) = B[2].\langle x, y\rangle$

$$\frac{\mathrm{d}}{\mathrm{d}t}\,y(t) = x - y \tag{18}$$

with(*DEtools*) :

$dfieldplot\left(\left[diff(x(t), t) = x(t) - 2\cdot x(t)\cdot y(t), diff(y(t), t) = \frac{x(t)^2}{2} - y(t)\right], [x(t), y(t)], t = -3..3, x = -2..2, y = -0.5..1\right);$



$DEplot\left(\left[diff(x(t), t) = \mathrm{x}(\mathrm{t}) - 2\cdot \mathrm{x}(\mathrm{t})\cdot y(t), diff(y(t), t) = \frac{\mathrm{x}(\mathrm{t})^2}{2} - y(t)\right], [x(t), y(t)], t = -3..3,\right.$

$[[x(0) = -0.8, y(0) = 0.3], [x(0) = -0.9, y(0) = 0.4]], linecolor = black)$