$H := (x, y) \to y^2 - 8 \cdot \cos(x);$

$$(x, y) \to y^2 - 8\cos(x) \quad \textbf{(1)}$$

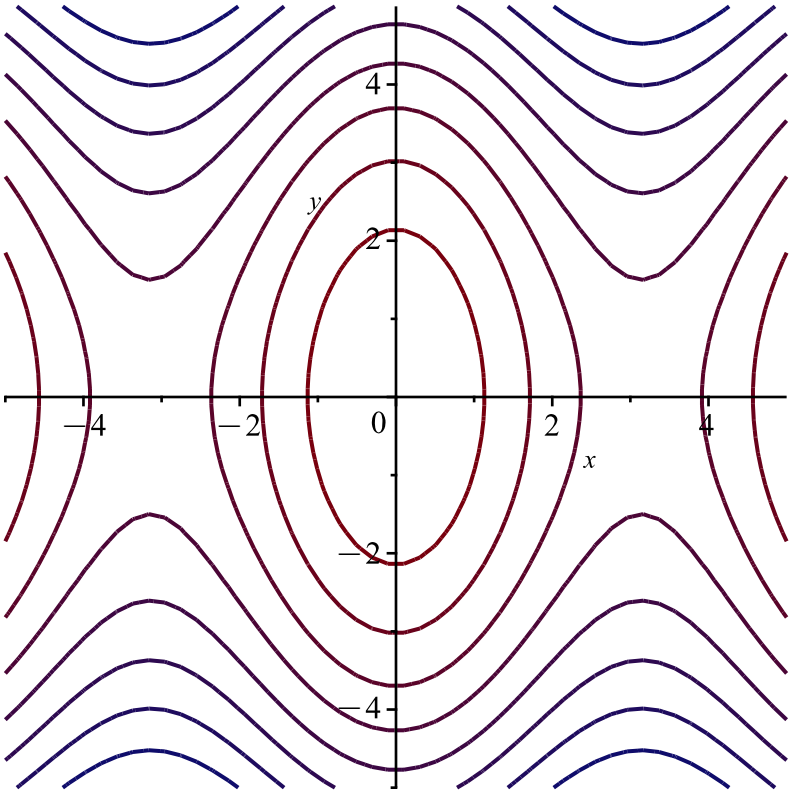
$eq := diff(H(x, y), x) \cdot y - 4 \cdot diff(H(x, y), y) \cdot \sin(x) = 0;$

$$0 = 0 \quad \textbf{(2)}$$

$eq := diff(H(x, y), x) \cdot y - 4 \cdot diff(H(x, y), y) \cdot \sin(x);$

$$0 \quad \textbf{(3)}$$

$with(plots):$
$contourplot(H(x, y), x = -5..5, y = -5..5);$



"Exercise 4"

"Exercise 4" **(4)**

"a) (1,1) -equilibrium non-hyperbolic point"

"a) (1,1) -equilibrium non-hyperbolic point" **(5)**

$f1 := 'f1'$

$$f1 \quad \textbf{(6)}$$

$f2 := 'f2'$

$$f2 \quad \textbf{(7)}$$

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

$$-x\,y + x \quad \textbf{(8)}$$

$f2 := -0.3 \cdot y + 0.3 \cdot x \cdot y;$

$$-0.3\,y + 0.3\,x\,y \quad \textbf{(9)}$$

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

$$\{x = 0., y = 0.\}, \{x = 1., y = 1.\} \quad \textbf{(10)}$$

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

$$(x, y) \to x + \mathit{VectorCalculus}\text{:-`-`}(x\,y) \tag{11}$$

$$f2 := (x, y) \to -0.3 \cdot y + 0.3 \cdot x \cdot y;$$

$$(x, y) \to (-1) \cdot 0.3\,y + 0.3\,x\,y \tag{12}$$

$$Jm := \mathit{Jacobian}([\mathit{f1}(x, y), \mathit{f2}(x, y)], [x, y]);$$

$$\begin{bmatrix} -y + 1 & -x \\ 0.3\,y & -0.3 + 0.3\,x \end{bmatrix} \tag{13}$$

$$A := \mathit{subs}([x = 1, y = 1], Jm);$$

$$\begin{bmatrix} 0 & -1 \\ 0.3 & 0. \end{bmatrix} \tag{14}$$

$$\mathit{eigenvalues}(A);$$

$$\mathit{eigenvalues}\left(\begin{bmatrix} 0 & -1 \\ 0.3 & 0. \end{bmatrix}\right) \tag{15}$$

$$H := (x, y) \to y - \ln(y) + 3 \cdot (x - \ln(x));$$

$$(x, y) \to y + \mathit{VectorCalculus}\text{:-`-`}(\ln(y)) + 3\,x + \mathit{VectorCalculus}\text{:-`-`}(3\ln(x)) \tag{16}$$

$$eq := \mathit{diff}(H(x, y), x) \cdot (x - x \cdot y) + \mathit{diff}(H(x, y), y) \cdot (-3 \cdot y + 3 \cdot x \cdot y);$$

$$\left(3 - \frac{3}{x}\right)(-x\,y + x) + \left(1 - \frac{1}{y}\right)(3\,x\,y - 3\,y) \tag{17}$$