The intersection points of two curves

x0,y0σ-initial approximation,n-number of solving

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inter(x0, y0, n) := | sol := | [ StepMax := 0  ε := 10^-14  X0_1 := x0  X0_2 := y0 + (9·Random(1) - 2)_1 ]
                            | [ u_1 := x_1  u_2 := x_2  Jac(x) := Jacobian(f(u), u) ]
                            | al_nleqsolve(X0, StepMax, ε, f(x), Jac(x))
                    for k ∈ [1..n]
                      | a_k := sol^T
                      | (δ_k := |f1(col(a_k, 1)_1, col(a_k, 2)_1)|) = "accuracy of solution"
                      | if k = 1
                      |   r := augment(a_k, δ_k)
                      | else
                      |   r := stack(r, augment(a_k, δ_k))
                    (rc := csort(r, 3)) = "sorting by δ"
                    for k ∈ [1..n]
                      | if col(rc, 3)_k < 10^-6
                      |   root_k := row(submatrix(rc, 1, n, 1, 2), k)
                      | else
                      |   break
                      | if k = 1
                      |   res := augment(root_k, ["." 6 "red"])
                      | else
                      |   res := stack(res, augment(root_k, ["." 6 "red"]))
                    res
```

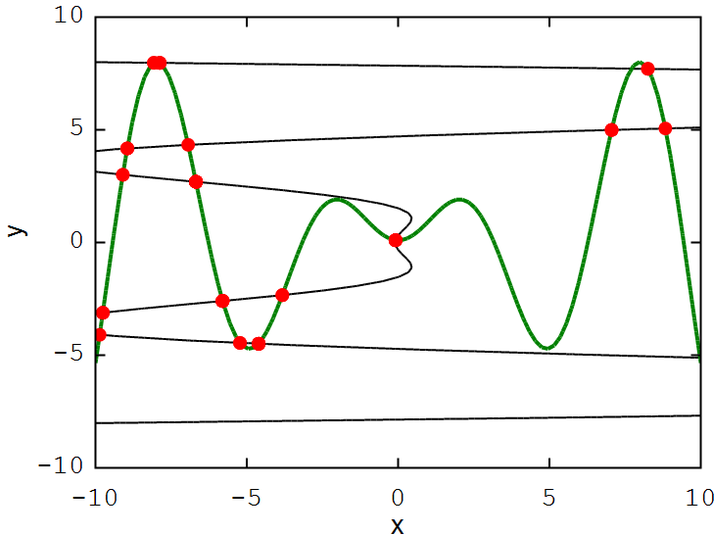
Example 1

$$f(x) := \begin{bmatrix} x_1 - x_2^2 \cdot \cos(x_2) + 0.1 \\ -x_2 + x_1 \cdot \sin(x_1) + 0.1 \end{bmatrix}$$

$$f1(x, y) := x - y^2 \cdot \cos(y) + 0.1$$

$$f2(x, y) := -y + x \cdot \sin(x) + 0.1$$

$A1 := inter(-8, -4, 20)$ $A2 := inter(8, 0, 50)$ $A3 := inter(-5, -0.1, 50)$ $A4 := inter(-8, 2, 20)$



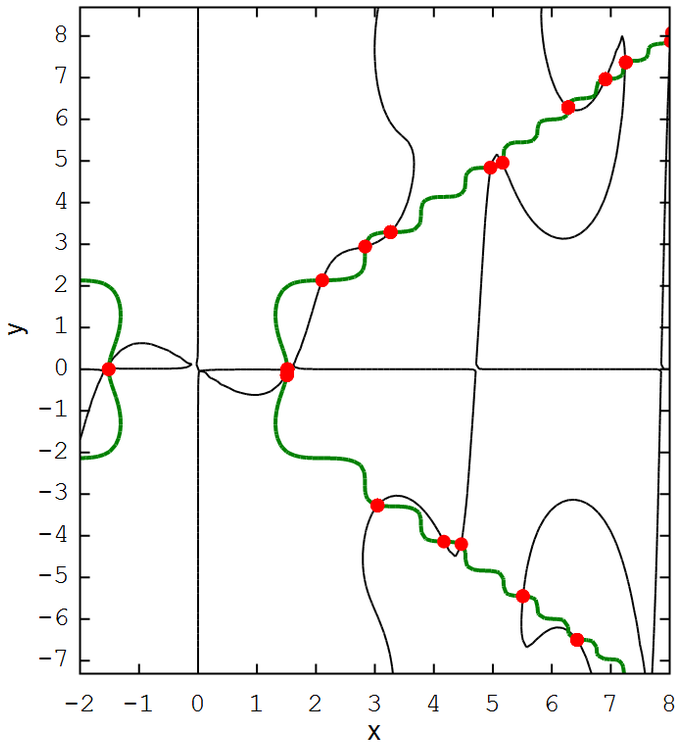
Examle 2

$$f(x) := \begin{bmatrix} (x_1)^2 \cdot \sin(x_2 \cdot \cos(x_1)) + (x_2)^2 \cdot \sin(x_1) \\ (x_2)^2 - (x_1)^2 + 2 \cdot \cos(x_1 \cdot x_2) + 0.3 \end{bmatrix}$$

$$f1(x, y) := x^2 \cdot \sin(y \cdot \cos(x)) + y^2 \cdot \sin(x)$$

$$f2(x, y) := y^2 - x^2 + 2 \cdot \cos(x \cdot y) + 0.3$$

$A1 := inter(6, 6, 50)$ $A2 := inter(7, -7, 50)$ $A3 := inter(7, 7, 50)$ $A4 := inter(2, 2, 10)$



Example 3

$$f(x) := \begin{bmatrix} 4 \cdot x_1^3 + 4 \cdot x_1 \cdot x_2 - 42 \cdot x_1 + 2 \cdot x_2^2 - 14 \\ 2 \cdot x_1^2 + 4 \cdot x_1 \cdot x_2 + 4 \cdot x_2^3 - 26 \cdot x_2 - 22 \end{bmatrix}$$

$$f1(x, y) := 4 \cdot x^3 + 4 \cdot x \cdot y - 42 \cdot x + 2 \cdot y^2 - 14$$

$$f2(x, y) := 2 \cdot x^2 + 4 \cdot x \cdot y + 4 \cdot y^3 - 26 \cdot y - 22$$

$A1 := inter(-6, -6, 50)$ $A2 := inter(-0.5, -0.5, 20)$ $A3 := inter(3, -2, 10)$