The intersection points of two curves

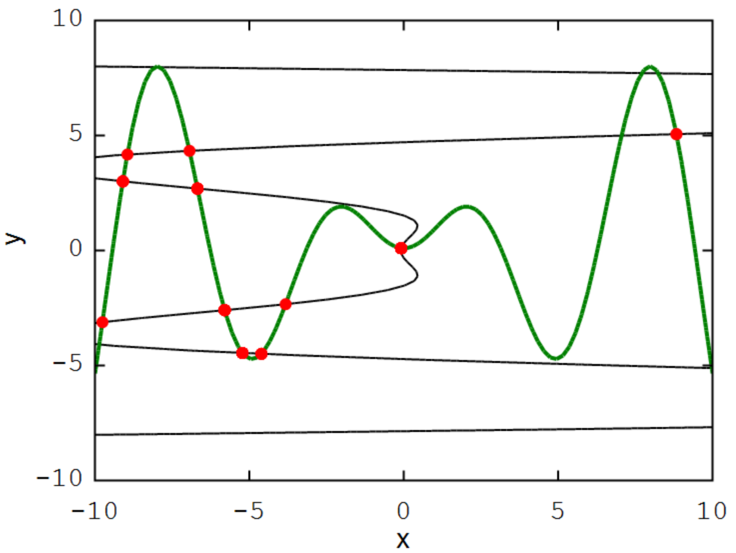
x0-initial approximation,n-number of solving

```
inter(x0, n) :=  | sol := | [ StepMax := 0   ε := 10^(−14)   X0_1 := x0   X0_2 := x0 + (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, ["." 5 "red"])
                 |   | else
                 |   |    res := stack(res, augment(root_k, ["." 5 "red"]))
                 | res
```

Example 1

$$f(x) := \begin{bmatrix} x_1 - x_2^{\,2}\cdot\cos(x_2) + 0.1 \\ -x_2 + x_1\cdot\sin(x_1) + 0.1 \end{bmatrix} \qquad \begin{aligned} f1(x, y) &:= x - y^2\cdot\cos(y) + 0.1 \\ f2(x, y) &:= -y + x\cdot\sin(x) + 0.1 \end{aligned}$$

$A1 := inter(2, 50)$ $A2 := inter(-5, 50)$ $A3 := inter(-0.1, 50)$



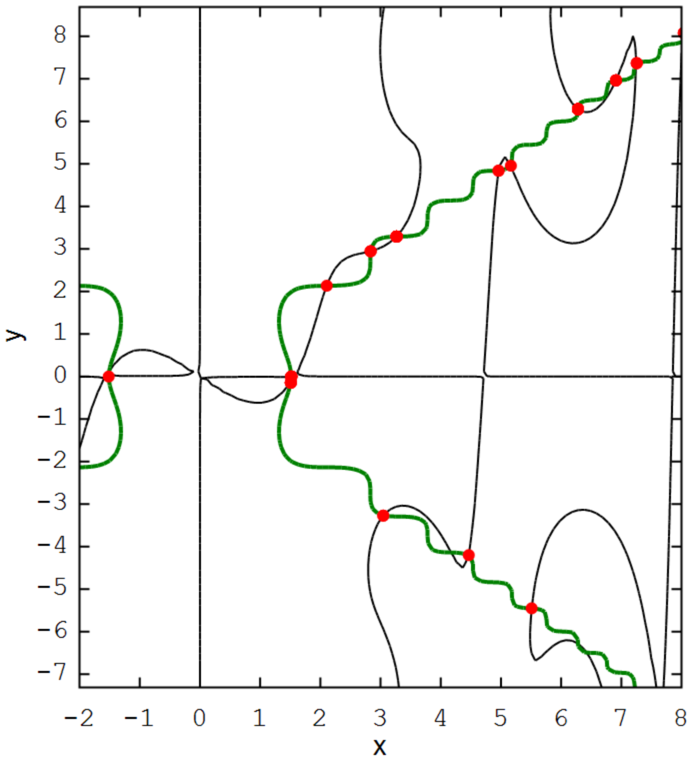
Examle 2

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

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

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

$A1 := inter(4, 50)$ $\quad A2 := inter(7, 50)$



Example 3

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

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

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

$A1 := inter(-6, 50)$ $\quad A2 := inter(-0.5, 50)$ $\quad A3 := inter(-0.01, 10)$