

Finding Distance of a Point from Curve with `al_nleqsolve`

Plot, λ

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Dist ( f ( 2 ) , x_o , A , h , ε ) := [ a := x_o r := 0 c := [ 1 .. 2 ] s := 0 NA := eval ( norme ( A ) ) ]
ϕ ( x ) := [ ( x_1 - A_1 )^2 + ( x_2 - A_2 )^2 - ( NA - h · k )^2
             f ( x_1 , x_2 ) ]
J ( x ) := [ 2 · ( x_1 - A_1 )      2 · ( x_2 - A_2 )
             d/dx_1 f ( x_1 , x_2 ) d/dx_2 f ( x_1 , x_2 ) ]
for k ∈ [ 2 .. NA/h ]
  a := al_nleqsolve ( a^T , 0 , 10^-5 , ϕ ( x# ) , J ( x# ) )^T
  if | f ( a_1 , a_2 ) | ≤ ε
    [ r := r + 1 s r_c := a_c ]
  else
    0
  [ a := s r_c G := J ( a )_2_c δ := norme ( A - a ) ]
eval ( [ [ a δ stack ( a , a + δ/2 · G/norme ( G ) ) s ] ] )

```

Example 1

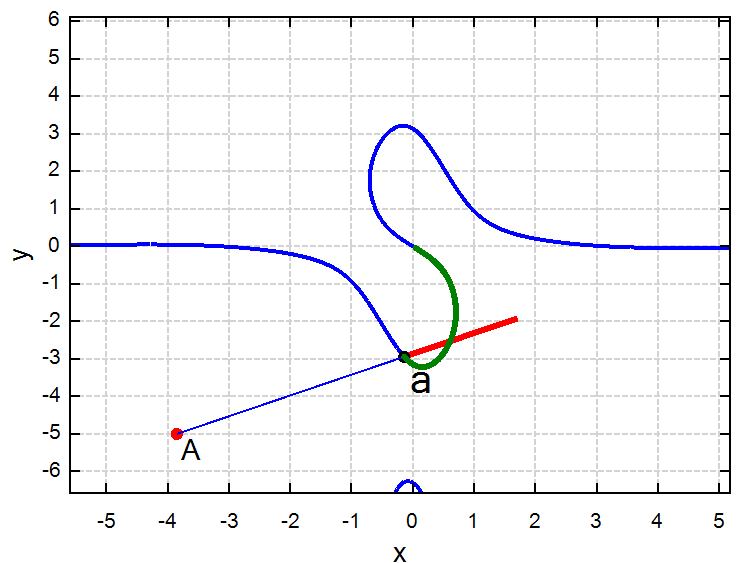
$$A := \text{eval} \left(\left[\begin{array}{c} (0.45 \cdot \text{random}(15) - 2) \cdot \lambda \\ 5 \cdot \lambda 1 \end{array} \right]^T \right)$$

$$f(x, y) := x^2 \cdot y - \sin(x + y)$$

$$B := \text{Dist} \left(f(x, y), \begin{bmatrix} -1 \\ 0 \end{bmatrix}^T, A, 0.004, 10^{-2} \right)$$

$$[a \ \delta \ N \ s] := B$$

$$a = [-0.1426 \ -2.9454] \quad \delta = 4.2387$$

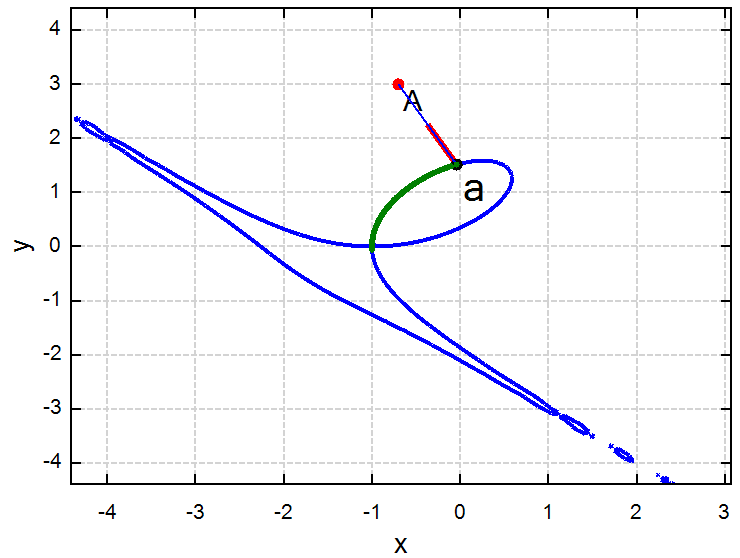
$$\text{rows}(s) = 517$$


Example 2

$$\left\{ \begin{array}{l} A := \text{eval} \left(\left[\left(0.45 \cdot \text{random}(10) - 2 \right) \cdot \lambda \ 3 \cdot 1 \right] \right) \\ f(x, y) := \ln \left(\left| 1 + (1+x)^3 - 3 \cdot y \cdot (1+x) + y^3 \right| \right) \\ B := \text{Dist} \left(f(x, y), [-1 \ 0], A, 0.004, 10^{-2} \right) \\ [a \ \delta \ N \ s] := B \end{array} \right.$$

$a = [-0.0405 \ 1.5167] \quad \delta = 1.6233$

$\text{rows}(s) = 364$

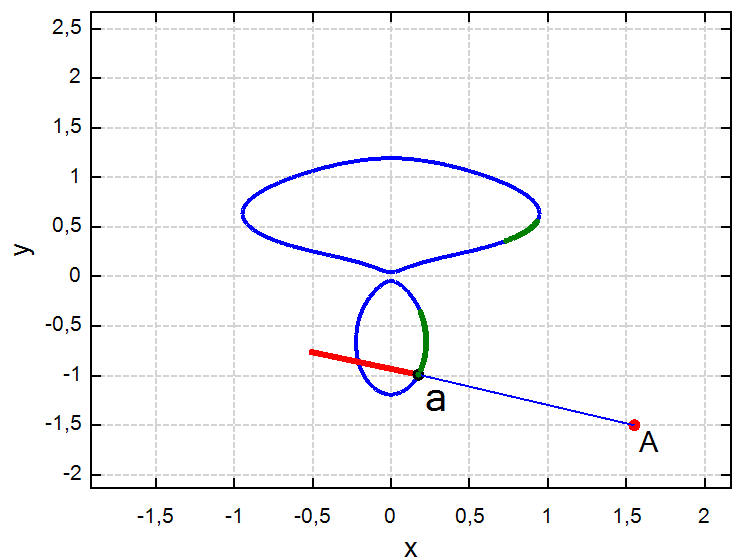


Example 3

$$\left\{ \begin{array}{l} A := \text{eval} \left(\left[\left(0.45 \cdot \text{random}(10) - 2 \right) \cdot \lambda \ 1.5 \cdot \lambda 1 \right] \right) \\ \alpha := 0.842 \\ f(x, y) := \frac{1}{\left(x^2 + y^2 - \alpha^2 \right)^2 + \left(2 \cdot x \cdot (y - \alpha) \right)^2} - 2 \\ B := \text{Dist} \left(f(x, y), [0 \ 1], A, 0.005, 10^{-3} \right) \\ [a \ \delta \ N \ s] := B \end{array} \right.$$

$a = [0.1747 \ -0.9897] \quad \delta = 1.467$

$\text{rows}(s) = 87$



Example 4

$$\left\{ \begin{array}{l} A := \text{eval} \left(\left[\left(0.45 \cdot \text{random}(20) - 0 \right) \cdot \lambda \ 6 \cdot \lambda 1 \right] \right) \\ f(x, y) := e^{-\frac{1}{3} \cdot \sqrt{x^2 + y^2}} \cdot \frac{x^2 - 2 \cdot y^2}{81 \cdot \sqrt{6 \cdot \pi}} + 0.005 \\ B := \text{Dist} \left(f(x, y), [-3 \ 3], A, 0.04, 10^{-3} \right) \\ [a \ \delta \ N \ s] := B \end{array} \right.$$

$a = [-3.8702 \ -3.6869] \quad \delta = 3.1042$

$\text{rows}(s) = 64$

