⊞ Viacheslav modified code for Draghilev's method

⊟ Jean example

Values $[\,a\;\; b\;\; c\,] := [\,2\;\; \sqrt{5}\;\; 5\,]$

Minimize & Maximize $\Phi := x^2 + y^2 + z^2$ subject to $\begin{cases} \varphi := \dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} - 1 \\ \Psi := x + y - z \end{cases}$

"Lagrangian" $L := \Phi + \lambda \cdot \varphi + \mu \cdot \Psi$

$$\begin{cases} fx := \dfrac{d}{d\,x} L \\ fy := \dfrac{d}{d\,y} L \\ fz := \dfrac{d}{d\,z} L \\ f\lambda := \dfrac{d}{d\,\lambda} L \\ f\mu := \dfrac{d}{d\,\mu} L \end{cases} = \begin{cases} \dfrac{x \cdot (4 + \lambda) + 2 \cdot \mu}{2} \\ \dfrac{2 \cdot y \cdot (5 + \lambda) + 5 \cdot \mu}{5} \\ \dfrac{2 \cdot z \cdot (25 + \lambda) - 25 \cdot \mu}{25} \\ \dfrac{5 \cdot \left(5 \cdot \left(-4 + x^2\right) + 4 \cdot y^2\right) + 4 \cdot z^2}{100} \\ x + y - z \end{cases}$$

$$V := \overrightarrow{X_{[1..5]}}$$

Minimize

$$F(X) := \begin{vmatrix} [\, x := X_1 \;\; y := X_2 \;\; z := X_3 \;\; \lambda := X_4 \;\; \mu := X_5 \,] \\ [\, fx \;\; fy \;\; fz \;\; f\lambda \;\; f\mu \,]^T \end{vmatrix}$$

$$Xo := \begin{bmatrix} 2 \\ -1 \\ 0 \\ -4 \\ 1 \end{bmatrix}$$ Guess value

Starting point

$$Xo := \mathrm{roots}(F(X), V, Xo) = \begin{bmatrix} 1.5738 \\ -1.3771 \\ 0.1967 \\ -4.4118 \\ 0.324 \end{bmatrix}$$

Draghilev method

$$[\, U \;\; Roots \,] := Draghilev\left(F(X), Xo, 0, 4, 10, 10^{-3}\right)$$

$\mathrm{rows}(U) = 11$

$$Roots = [\, 1.5738 \;\; -1.3771 \;\; 0.1967 \;\; -4.4118 \;\; 0.324 \,]$$

The maximum of F is the minimum of G = -F

Maximize

$$G(X) := \begin{vmatrix} [\, x := X_1 \;\; y := X_2 \;\; z := X_3 \;\; \lambda := X_4 \;\; \mu := X_5 \,] \\ [\, -fx \;\; -fy \;\; -fz \;\; f\lambda \;\; f\mu \,]^T \end{vmatrix}$$

$$Xo := \begin{bmatrix} 1 \\ 1 \\ 3 \\ -10 \\ 3 \end{bmatrix}$$ Guess value

Starting point

$$Xo := \mathrm{roots}(G(X), V, Xo) = \begin{bmatrix} 1.026 \\ 1.539 \\ 2.5649 \\ -10 \\ 3.0779 \end{bmatrix}$$

Draghilev method

$$[\, U \;\; Roots \,] := Draghilev\left(G(X), Xo, 0, 4, 10, 10^{-3}\right)$$

$\mathrm{rows}(U) = 11$

$$Roots = [\, 1.026 \;\; 1.539 \;\; 2.5649 \;\; -10 \;\; 3.0779 \,]$$

Alvaro