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Optimization – Exercise 3 – WS 21/22
KKT conditions and Multiobjective Optimization

Exercise 3.1 – For Preparation: Constrained optimization problems and KKT conditions

Consider the optimization problem

$$\min \quad \frac{1}{2}\left(x_1^2 + x_2^2\right)$$
$$\text{s.t.} \quad x_1 + x_2 + 2 \leq 0.$$

Solve the OP

a) graphically,

b) analytically using the KKT conditions,

c) numerically in MATLAB using `fmincon`.

Exercise 3.2 – For Preparation: Relation of scalarization methods

In the lecture we presented you the following four scalarization methods:

- weighted-sum method

- reference-point method

- ε-constraint method

- Pascoletti-Serafini scalarization

Some of these methods are related to oneanother. In particular, show that:

a) the ε-constraint method is special case of Pascoletti-Serafini scalarization, if direction $\boldsymbol{d}$ and point $\boldsymbol{s}$ are chosen correctly.

b) the norm within the reference point method can be chosen such that the method corresponds to weighted-sum method.
   Hint: Take a look at slide 14 of lecture 8.

You are free to come up with formal mathematical reasoning or intuitive graphical arguments.