Exercise 1

Let's say we want to find the minimum value of a simple mathematical function, such as the quadratic function:

$$f(x) = x^2 + 5x + 6$$

We can use the minimize function from the scipy.optimize library to find the minimum value of this function.

Exercise 2

Let's say we want to minimize the following nonlinear function:

$$f(x) = x_1^2 + x_2^4 + \sin x$$

Exercice 3

In this example, we'll minimize a quadratic objective function subject to an equality constraint:

Objective Function:

$$f(x) = x_1^2 + x_2^2$$

Subject to the Equality Constraint:

$$x_1 + x_2 = 1$$

Exercise 4

In this example, we'll minimize a more complex objective function subject to multiple equality constraints:

Objective Function:

$$f(x) = x_1^2 + x_2^2 + x_3^2$$

Subject to the Equality Constraints:

$$x_1 + x_2 = 1$$
$$x_2 + x_3 = 2$$
$$x_1 + x_3 = 3$$

Exercise 4

In this example, we'll minimize the objective function subject to an inequality constraint:

Objective Function:

$$f(x) = x_1^2 + x_2^2$$

Subject to the Equality Constraint:

$$x_1 + x_2 \geq 1$$

Exercise 5

In this example, we'll minimize the objective function subject to multiple inequality constraints:

Objective Function:
$$f(x) = -x_1 x_2 x_3$$

Subject to the Equality Constraints:
$$x_1^2 + x_2^2 = 1$$
$$x_2^2 + x_3^2 = 1$$

And one inequality constraint:
$$x_1 + x_2 + x_3 \leq 2$$