Alexandria University
Faculty of Computers and Data Science
NLO Fall’25

جامعة الإسكندرية
ALEXANDRIA
UNIVERSITY
كلية الحاسبات وعلوم البيانات

Bonus Task

Instructions:

1. Download the provided starter file from this link
2. Insert your implementation inside the file **without** changing any variable names, function names, or structure. Don’t delete anything written in the code.
3. Make sure that your function returns the values in the correct format as written in the function description in the starter code. **This is crucial for it to pass my test runs**
4. Save your final submission with the following naming format: studentName_studentID.py
   Example: HagarHazem_202211.py
5. Submit your .py file to this form **(Deadline: Sunday 14/12 11:59 PM)**

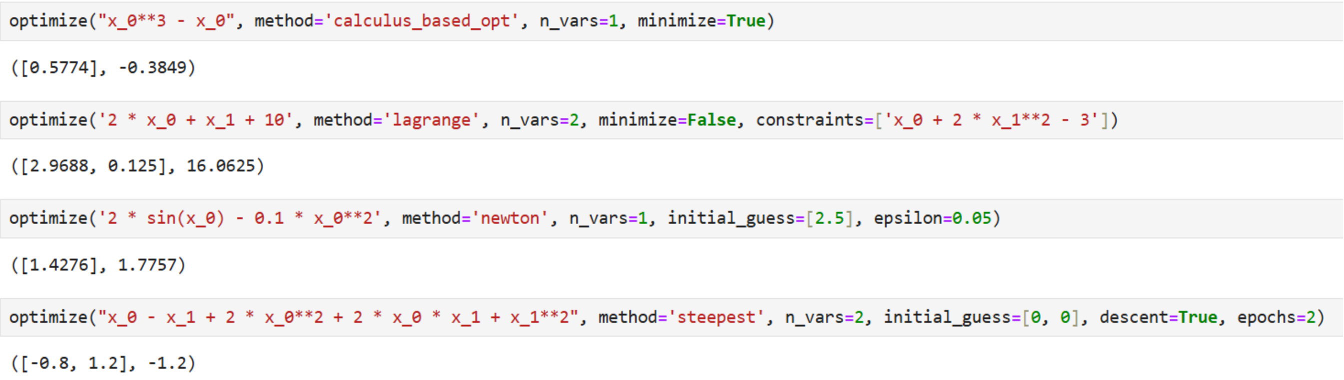
Requirements:

You are expected to combine all the functions from the previous 4 tasks into one function. The function should accept a `method` parameter to select the optimization approach and route to the appropriate function, ensuring all required parameters are validated and passed correctly for each method.

Rules:

- Cheating or code sharing (in any form) will result in a zero mark for both parties **(non-negotiable)**.
- Use of AI-generated code is strictly prohibited. If detected, the mark for this assignment will be 0.

Examples:



```
optimize("x_0**3 - x_0", method='calculus_based_opt', n_vars=1, minimize=True)
```

```
([0.5774], -0.3849)
```

```
optimize('2 * x_0 + x_1 + 10', method='lagrange', n_vars=2, minimize=False, constraints=['x_0 + 2 * x_1**2 - 3'])
```

```
([2.9688, 0.125], 16.0625)
```

```
optimize('2 * sin(x_0) - 0.1 * x_0**2', method='newton', n_vars=1, initial_guess=[2.5], epsilon=0.05)
```

```
([1.4276], 1.7757)
```

```
optimize("x_0 - x_1 + 2 * x_0**2 + 2 * x_0 * x_1 + x_1**2", method='steepest', n_vars=2, initial_guess=[0, 0], descent=True, epochs=2)
```

```
([-0.8, 1.2], -1.2)
```