

E0 230 CMO Assignment 0

Instructions

1. Read all instructions before starting the assignment.
Read them again before submitting the assignment.
2. Submissions that do not adhere to the instructions will be given **zero marks**.
3. This is an **individual assignment**, all work including code should be your own.
4. **Do not use AI generated code.**
5. Any form of academic dishonesty will be treated as per the IISc and CSA academic integrity policy.
6. You will submit a **Microsoft Office Form**, a **single** PDF file (max 2 pages not including references), and a **single** .py file for this assignment. Upload the files directly; **do not zip them**.
 - (a) Microsoft Office Form link: <https://forms.cloud.microsoft/r/a75BCx8mc1>. Only one response per person. **Ensure you click ‘Save my response to edit’ to be able to edit your answer until deadline.**
 - (b) Name the pdf file **CMO2025A0_vwxyz.pdf** where vwxyz is your five-digit SR number. The pdf file should be generated using the **LaTeX template provided in the Class Materials folder** in the Files Section of the Team. Your pdf should include all values, justifications, and graphs (if any) that you are asked to report.
 - (c) Name the .py file **CMO2025A0_vwxyz.py** where vwxyz is your five-digit SR number. Your python file should contain all code that you used to solve this assignment. **Only .py files are accepted**; no notebooks.
7. We will not open or evaluate any other file submitted.
8. Incomplete submissions (without the form, pdf, or .py file) will not be evaluated.
9. **This assignment is due by 23:59, 17 August.**
10. Late submissions will incur a 20% penalty per day.

Oracle Instructions

1. Use the Oracle in a Unix-like terminal.
2. Windows users must run it via Windows Subsystem for Linux (WSL).
3. Run all code for this assignment in a virtual environment with Python version 3.10.
4. Unzip the Oracle into the directory you are working in.
5. Do not modify the `oracle_2025A0` folder.
6. Place your `.py` file and the `oracle_2025A0` folder in the same directory.
7. Import the Oracle using `from oracle_2025A0 import oracle`.
8. Call the Oracle using `a,b = oracle(12345,42)` to get $a = f(42)$ and $b = f'(42)$.
9. Set up the Oracle by 23:59, 12 August.
10. No support will be provided for Oracle issues after this deadline.

Question 1

You are given access to a function $f : \mathbb{R} \rightarrow \mathbb{R}$ through an oracle \mathcal{O} . When queried with your five-digit SR number and $x^{(t)} \in \mathbb{R}$, \mathcal{O} will return a tuple

$$(f(x^{(t)}), f'(x^{(t)})),$$

where

$$f'(x^{(t)}) = \left. \frac{df}{dx} \right|_{x^{(t)}}$$

is the derivative of f at $x^{(t)}$. Find the solution to the optimization problem

$$x^* = \operatorname{argmin}_{x \in \mathbb{R}} f(x)$$

using any computational technique.

REPORT:

1. Describe the technique you used with appropriate references. (2 marks)
2. The value of x^* . (1.5 marks)
3. The value of $f(x^*)$. (1.5 marks)