The University of Queensland

School of Information Technology & Electrical Engineering

Engg7302 Advanced Computational Techniques in Engineering

Assignment 1: Optimisation (A)

Due date: 23/08/2024 3:00 pm

Where to submit: Submit the assignment report via the Blackboard Turnitin submission system.

Instruction:
For this assignment, you must attempt to solve different optimisation problems. For each question, you are required to report your results in detail. It should include your best solution and its corresponding solution procedures. If you are asked to solve those sub-questions using MATLAB, their MATLAB source code with detailed comments is required.
Marks will be awarded based on how well your submission addresses the above points.

This assignment is worth 10% of the total marks for the course.

Question 1

You have one type of chicken wire to build a temporary enclosure for housing chickens in your backyard. Your plan is to build a triangular enclosure with sides of lengths x, y and z, respectively. See Figure 1:

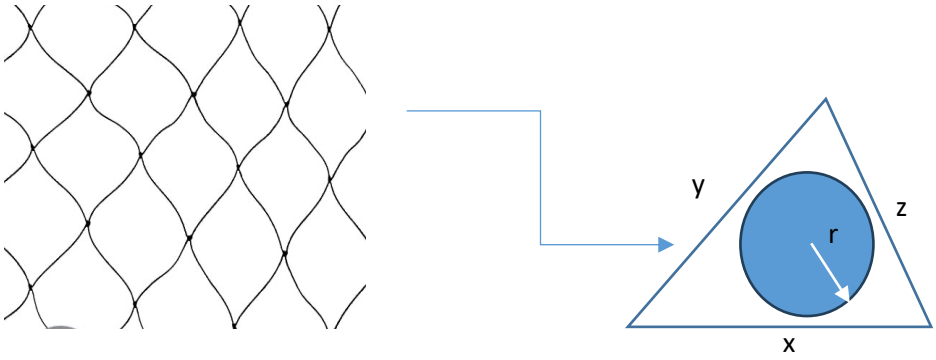

Figure 1 Triangular enclosure (chicken house) and the inner circle.

You have 100m of chicken wire, your goal is to maximise the area of the circle inside the triangular enclosure for your given materials.

Assuming that two sides of the triangle are equal in length (x=y), you are tasked with determining the lengths of the three sides (x, y, and z) using different optimisation methods.

(a) Apply the Lagrange multiplier method. In your implementation, you **must** use three variables: x, y, and z. If fewer unknown variables are used, no marks will be awarded. There is no requirement for MATLAB code in this part of the question.

(b) Employ the Golden Section Search and Newton's methods. Please transform it into a one-dimensional optimisation problem and include your MATLAB code.

Reference:

https://en.wikipedia.org/wiki/Incircle_and_excircles#:~:text=In%20geometry%2C%20the%20incircle%20or,and%20excircles%20of%20a%20triangle.