In-Class Activity 3 - Mechanical Design Problem

ME 3001-002- Mechanical Engineering Analysis - Fall 2021

Learning Objectives:

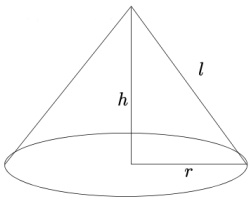
- Practice using root find methods in MATLAB to solve an applied engineering problem.

Overview:

As an engineer you are asked to design a structure. The geometry of this structures is simple but certain properties are critical.

Overview:

What is the *mathematical model* of the cone?



surface area, $s = \pi r l = \pi r\sqrt{h^2 + r^2}$
volume, $v = \pi r^2 \frac{h}{3}$

Design Requirements:

The design is required be cone with a surface area of exactly $25m^2$ to a tolerance of 0.1 m^2 and a height of exactly $1m$. Your goal is to find the radius in meters that would produce this exact design.

Required Materials:

- **Your Computer**: This activity requires a computer with MATLAB installed.

Activity:

1. Write a MATLAB program to solve the mechanical design problem described on the previous page. *Remember to put a proper header at the top of your main program, and clear the workspace in the script directly below the header.* The main file of your program should be called **<USERNAME>_activity3.sldprt**
2. Test your program with a range of initial guesses for the design variable r. Is the algorithm robust to different inputs?
3. Show the results of your algorithm using three different initial guesses. You can use the default output to the command window the *fprintf()* function. Summarize the results in a file **<USERNAME>_activity3.pdf**
4. Write a description of how your algorithm works to solve the problem. This can be a few sentences or a bulleted list.

Submit:

Submit the most complete version of **<USERNAME>_part1.sldprt**
and **<USERNAME>_part1.pdf** to the Activity 3 folder before the posted due date.