ECOR 1606 Lab Midterm v16

The interface pressure between the tire of a locomotive wheel and the hub is given by

$$p = \frac{\delta / b}{\left(\frac{1}{E}\right)\left(1 + \frac{c^2 + b^2}{c^2 - b^2}\right)}$$

where p is the interface pressure (in Pa)
b is the radius of the hub (in m)
c is the radius of the hub plus the tire thickness (in m)
δ is the amount of interference (in m)
E is Young's modulus for the material (use $E = 207 \text{x} 10^9$ Pa)

Write a program that repeatedly reads in hub diameters, tire thicknesses, and interference values (all in m) until -1 -1 -1 is entered. For each set of values entered your program should either i) output an error message (if the values are unreasonable: see next paragraph) or ii) compute and output the interface pressure.

Hub diameters must be between 0.5 m and 2.5 m (inclusive of these values), tire thicknesses must be between 0.05 m and 0.1m (inclusive of these values), and interference values must be greater than zero and no more than 0.5% of the diameter.

When -1 -1 -1 is entered your program should output:

i) the average of all computed interface pressures and

ii) the greatest interface pressure and the corresponding diameter, tire thickness, and interference values. In the event of a tie either set of values may be output.

Notes:

- The radius of a circle is half of its diameter.
- See supplied file "*1606w11labfinal.cribsheet.pdf*" for a list of available C-- / C++ functions.

If you think any of the above is unclear, run the sample executable provided. We will **not** clarify or explain the question. You may wish to refer to supplied file "*1606w11.midtermlabmarking.pdf*" for further details on the lab midterm test.

You may write your program using C-- or C++. If you choose C++, use supplied file "*framework.cpp*" as your starting point and call your program "*midv16.cpp*". If you choose C--, call your program "*midv16.cmm*" and when you are finished select "Create a C++ Program" from the File menu to save it as a C++ program called "*midv16.cpp*".

Submit "*midv16.cpp*" using the **lab test** version of the submit program by the end of your lab period.