**Engineering Application II**

This review will help you understand and complete the assignment described in the R script “*Engineering\_problem\_II.R*”.

You will find what you will have to turn in at the end of the R script:

# 5) Turn in the following !! ####

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# (A) Create a plot for the function defined in Equation 4

# i) Add a main title for the plot

# ii) Add your name as "sub title"

# (B) Include the exact solution:

# "How deep the float ball in Figure 1 should be immersed so that a required flush volume can be maintained?"

# (C) Upload your document as a single PDF file to Canvas

## Maintain the Required Flush Volume in a Tank/Cistern

One of the least talked about but probably one of the most important functions of day to day life is flushing (Figure 1).

Our interest here is to know how deep the float ball in Figure 1 should be immersed so that a required flush volume can be maintained.

In a typical household, units are equipped with a single flush volume of 1.6 gallons. Consider the following data:

|  |  |
| --- | --- |
| Density of float ball () 0.40 g/cm3 | Density of water () 1 g/cm3 |
| Radius of float ball () 10 cm |  |

Diagram

Description automatically generated

Figure

We simplify this problem by assuming that the mass of water () displaced when the float ball is submersed to the required depth () is equal to the mass of the float ball ().

The mass of water displaced (), and the mass of the float ball () can be estimated as

Diagram, venn diagram

Description automatically generated

Figure

|  |  |
| --- | --- |
|  | Equation |
|  | Equation |

Now, apply the Archimedes’ Law which states that a body immersed in a fluid experience an upthrust equal to the weight of the fluid displaced, we can state that . From Equation 1 and Equation 2, we can write that

|  |  |
| --- | --- |
|  | Equation |

Simplifying Equation 3 results in the following:

|  |  |
| --- | --- |
|  | Equation |

By substituting values for , , and , Equation 4 becomes

|  |  |
| --- | --- |
|  | Equation |

Follow the guidelines provided in “*Engineering\_problem\_II.R*” and complete this assignment.