**CIS 449 Assignment 2: Converting Coordinates**

**Due: 6/11/2023 @ 11:59 PM**

In this assignment, you have been provided with a text file of a series of coordinates in (x,y,z) format (commonly referred to as 3-space). This is like the Cartesian plane (x,y), but with a third dimension. Another name for this is Euclidean space. Your task is to create a set of code that will do the following things:

1. Read in the contents of the text file to a table, with headers as given in the file.
2. Make the following things the body of a loop:
   1. One that will convert an (x,y,z) into cylindrical coordinates (r,θ,z)
   2. One that will convert an (x,y,z) into spherical coordinates (*p*,θ,φ)
3. Using some kind of loop, use this procedure to populate either a matrix or array that contains the converted values (cylindricals separate from sphericals)
4. After the loop has completed, write each of those arrays/matrices to a separate .csv file.

Note: for those of you interested in things like video game design, virtual reality, flight simulators, etc., coordinate transformation is an essential skill that comes from either courses in linear algebra or multi-dimensional calculus courses. The math is not hard (there are formulas for it that can be found online). Your job here is to implement the formulas. Do not write functions to do it – we will work with functions later.

R may have libraries that do coordinate conversion. For the purposes of this exercise, you are NOT to use such libraries! Only use what you know.

Trigonometric functions are essential for this exercise

sin

cos

tan

cot

sec

csc

and their appropriate inverse functions (a\_\_\_)

Each of these functions inputs a single numerical argument and produces a value.