CSci 5607, Spring 2022 Name _____
Assignment 1a: Getting Started with Ray Casting
Due: Friday Feb 4th Score (out of 100) _____

____ The program is capable of correctly reading a valid scene description from a file. The input processing is flexible enough to be able to correctly handle keywords that are presented in arbitrary order. The name of the input file is accepted as a command line argument. (10 pts)

____ Given valid input viewing parameters (view origin, view direction, view 'up' vector, vertical field of view angle, and output image dimensions) the program correctly determines the corresponding 3D viewing coordinate system [(*u, v, n*), where the vectors *u* and *v* define the horizontal (left-to-right) and vertical (down-to-up) directions of a viewing window in 3D world coordinate space and $n = -view\_dir$]. The program correctly uses this information to define, either directly or indirectly, a viewing window that, in conjunction with the view origin, delimits the volume of space whose contents will be rendered into the ray-traced image. (15 pts)

____ The program allocates an appropriately-sized 2D image array to store the (*r*, *g*, *b*) colors of each pixel that will make up the final image, and defines an appropriate one-to-one mapping between pixels in this 2D image array and 3D points in the viewing window to enable an even sampling of the 3D scene. For each pixel, a viewing ray is correctly defined and cast into the scene to be able to determine the color values to be stored at that point in the image. (15 pts)

____ The program correctly determines when and where a viewing ray intersects a single sphere. This capability is demonstrated via an image that shows a color difference between pixels where a ray/sphere intersection occurs and pixels where there is no ray/sphere intersection. The colors in the rendered image appropriately correspond to the specified colors in the input file. (15 pts)

____ The program correctly renders scenes containing more than one sphere, and correctly renders multiple spheres of different colors. (10 pts)

____ The program correctly outputs the final computed image in a valid PPM format and the student has submitted a "showcase" image that illustrates the capabilities of their program. (5 pts)

____ The program is robust. It gracefully exits with an appropriate error message if any of the required input files or scene description data are missing or if any of the provided scene description data is discovered to be "invalid" at the time of its use. Specifically, no assumptions are made about the input that would cause the program to "crash" if violated. (10 pts)

____ The student has turned in a 1-3 page writeup that answers each of the three questions specified in the project description and is appropriately illustrated using images produced by the student's own program. (15 pts)

____ The required items were submitted as a single .zip file, and a Makefile, CMake file, or equivalent, was included to facilitate compiling the provided code. The submitted code is clearly documented and is platform independent (meaning that it can be compiled and run using any of: Windows/Linux/MacOS). (5 pts)

____ The program is capable of correctly handling cylinders as well as spheres. (7pts extra credit)