CSci 5607, Fall 2019 Name _____
Assignment 1c: Triangles, Texture and Parallel Projection
Due: Wednesday Oct 16th Score (out of 100) _____

___ The program robustly accepts extended scene description files that include texture images and triangle definitions, including texture coordinates and per-vertex surface normals. The program correctly reads the specified information and stores it in a suitable data structure. (5 pts)

___ The program correctly computes ray/plane as well as ray/sphere intersection points. (10 pts)

___ The program correctly performs point-in-triangle testing using Barycentric coordinates. (15 pts)

___ When per-vertex surface normals are provided, the program can accurately achieve smooth shading at every point within a triangle by using a correctly interpolated, unit-length surface normal direction $\boldsymbol{N}$ in the Phong illumination equation. The interpolated normal is achieved from the provided normals at the triangle vertices by using the barycentric coordinates as weights. (10 pts)

___ When per-vertex normals are not provided, the program can accurately achieve faceted shading (a constant color value is shown at every point within a triangle) by using the normal to the plane of the triangle when evaluating the Phong illumination equation at the ray/triangle intersection point. (10 pts)

___ The program is capable of calculating appropriate texture coordinate at all ray/sphere intersection points using a pre-determined 1-1 mapping between the 3D surface normal direction and a 2D parametric representation of the sphere surface. (15 pts)

___ The program is capable of correctly interpolating a texture coordinate to a ray/triangle intersection point from the texture coordinate values at the vertices using Barycentric coordinates. (10 pts)

___ The program uses an appropriate mapping (nearest neighbor or bi-linear interpolation) to retrieve the correct corresponding color for a given texture coordinate from the appropriate texture map, and that texture color is used for the object's diffuse color in the Phong illumination equation. (15 pts)

___ The student has submitted a sufficient set of scene description files and accompanying images to successfully demonstrate all of the capabilities of their program, including, for example: rendering a single opaque triangle, rendering a single textured triangle, rendering a polygonal model using flat shading, rendering a polygonal model using smooth shading, rendering a texture-mapped polygonal model, and rendering one or more textured spheres. The scenes are creatively constructed and accurately rendered. (10 pts)

___ For 5% extra credit, the program is capable of rendering the input scene using an orthographic and/or oblique parallel projection, rather than a perspective projection. At least one pair of images is provided that demonstrates the success of this implementation by showing the same scene rendered with both a perspective and an parallel projection. (5 pts)