CPSC 314 Homework 3

NOTE: These homework problems are not graded. **However**, I strongly encourage you to take them seriously as a preparation for the second quiz and the final exam.

This problem sheet deals with shading/lighting amd scan conversion. Solutions will be discussed in the labs in the week of February 7-11.

1   Shading and Lighting

Note: you may have to wait until the Monday lecture to solve this question (or read up on Flat, Gouraud, and Phong shading in the book).

Consider a square with corners located at $(-1, -1, 0)^T$, $(+1, -1, 0)^T$, $(+1, +1, 0)^T$, and $(-1, +1, 0)^T$, and a single point light source positioned at $(0, 0, 1)^T$, as depicted in the figure below. Let the shading normals in the vertices correspond to the z direction (i.e. the actual geometric normal of the square).

The camera is positioned where the light is, and looks down on the square. You can assume that the square has been subdivided into two triangles along one of the diagonals. **The point light source has a quadratic falloff.**

For each of the following combinations of shading and lighting models, describe the intensity distribution across the square.
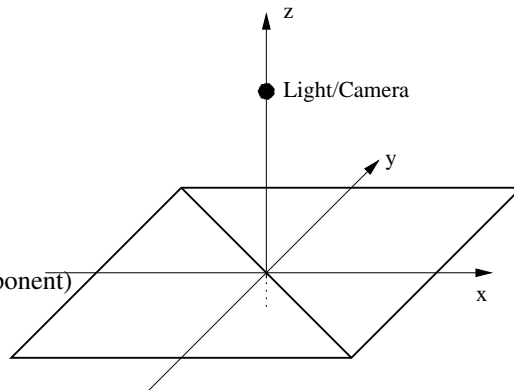
a) Purely diffuse material with flat shading

b) Phong material with flat shading (no diffuse component)

c) Purely diffuse material with Gouraud shading

d) Phong material with Gouraud shading (no diffuse component)

e) Purely diffuse material with Phong shading

d) Phong material with Phong shading (no diffuse component)

2 Scan Conversion of Lines

a) Give pseudo-code for the DDA (Digitial Differential Analyzer) algorithm for scan-converting lines. Assume the start point is to the left of the endpoint, and the slope is in the range $0 \ldots 1$.

b) What are the key differences between the DDA and the Bresenham algorithm? What are the respective advantages and disadvantages?