CPSC 314 Homework 3

1   Scan Conversion

a) Derive the **edge equations** for scan-converting the triangle given in device/pixel coordinates below. Pay attention to the sign of the equations, so that positive values correspond to the inside of the triangle.
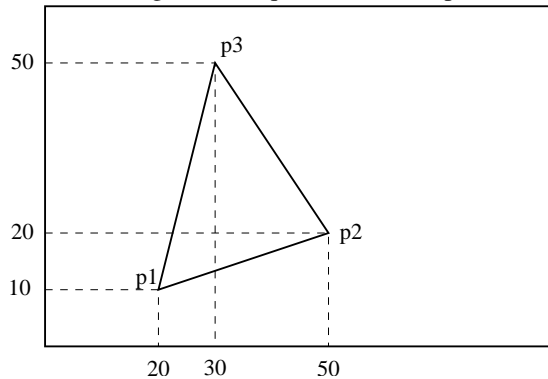
b) Derive the **plane equation** for interpolating some property c across the triangle. The values at the vertices are $c_1 = 0$, $c_2 = 1$, and $c_3 = 2$, respectively. You don't need to solve any equation systems that may arise.

2 Shading and Lighting

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. 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)