

**MATH 519 Quiz 2****Name:**

Show all work. 5 points each.

1. Use Greens Theorem to prove Greens first identity.

2. Use Green's first identity to show that the solution to the Dirichlet problem on the disk is unique given the boundary information.

$$\iint_{\Omega} (u\nabla^2 v + \nabla u \cdot \nabla v) dA = \int_{\Gamma} u \frac{\partial v}{\partial n} ds$$

$$\iint_{\Omega} (u\nabla^2 v - v\nabla^2 u) dA = \int_{\Gamma} \left( u \frac{\partial v}{\partial n} - v \frac{\partial u}{\partial n} \right) ds$$

$$\frac{\partial u}{\partial n} = \nabla u \cdot \vec{n} = \langle u_x, u_y \rangle \cdot \frac{\langle y'(t), x'(t) \rangle}{\sqrt{y'(t)^2 + x'(t)^2}}$$