Due on October 9, 2006, Monday, Class time. No late submissions!

**MATH 302 Homework 1**

1: Evaluate $\int_0^\infty \frac{dx}{1 + x^\alpha}$ where $\alpha > 1$. Take into account that $z^\alpha = exp(\alpha \ln z)$ is not defined at the origin.

2: Evaluate $\int_0^\infty \frac{dx}{(1 + x^2)^n}$ where $n \geq 1$ is an integer.

3: Find a conformal mapping of the disc $x^2 + (y - 1)^2 < 1$ onto the first quadrant $x, y > 0$. Investigate the conformal property of your map also on the boundaries.

4: Describe the image of the unit disc under the transformation $\ln \left( \frac{z - 1}{z + 1} \right)$, where an appropriate branch of the logarithm is used.