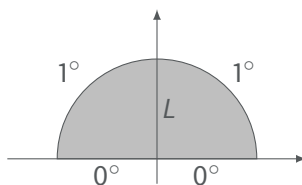


## Math 344 Quiz 5

Names: \_\_\_\_\_

1. The base of a semicircular plate of radius  $L$  is held at  $0^\circ$  while the top arc is held at  $1^\circ$ :



- a. Let  $u(r, \theta)$  be the steady state temperature in the plate at the polar coordinates  $r, \theta$ . In polar, the steady state heat equation  $u_{xx} + u_{yy} = 0$  becomes

$$r^2 u_{rr} + r u_r + u_{\theta\theta} = 0.$$

Assuming  $u(r, \theta) = R(r)\Theta(\theta)$ , turn this PDE into two DE's with boundary conditions.

- b. Solve for  $\Theta$ .

c. Solve for  $R$ . (Since  $\lim_{r \rightarrow 0} R(r) < \infty$ , one of the two answers for  $R$  can be disregarded.)

d. What is  $u(r, \theta)$ ? (Give a formula for the constants in the solution.)