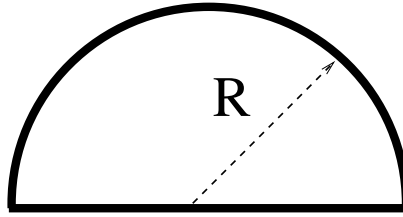**HW assignment 6**   Due Monday March 2 by 5 p.m. in my mailbox

Find the cutoff frequency for the **TM** modes propagating in the cylindrical wave guide with the half-moon cross section (see the figure below) The roots of Bessel functions may be found in *Jackson*)

Solution

The solution for the TM mode in the case of cylindrical wave guide is

$$\psi(s,\theta) = J_m(x_{mn}\frac{s}{R})e^{\pm im\phi}$$

For the half-moon cross section, we need an additional boundary condition $\psi(\theta = 0) = \psi(\theta = \pi) = 0$ which corresponds to

$$\psi(s,\theta) = J_m(x_{mn}\frac{s}{R})\sin m\phi$$

Thus, the cutoff frequency corresponding to $m = 1$ is

$$\omega_{11} = c\frac{x_{11}}{R} = \frac{3.832}{R}c$$