Tasks on chapter 14 – Siegman's book

Problem 1 from Siegman's book p579:

1. *Higher-order mode suppression during laser turn-on.* A certain laser cavity has a lowest-loss eigenmode $\tilde{E}_{00}$ with eigenvalue $|\tilde{\gamma}_{00}| = 0.9$ and a next-lowest-loss eigenmode $\tilde{E}_{01}$ with eigenvalue $|\tilde{\gamma}_{01}| = 0.8$ (as well as numerous higher-loss eigenmodes). When this laser is first turned on, the unsaturated gain during the initial build-up period is 40% power gain per one-way pass down the laser cavity ($G_1 = |g_1|^2 = 1.4$). How many round trips will it take before the circulating power in the laser cavity has become 99% lowest-order transverse mode, assuming for simplicity that the lowest and next-lowest eigenmodes have equal initial noise amplitudes and that this all takes place during the initial build-up period before gain saturation begins to occur?

Home-made problem: Transverse mode selection

1- Explain the relationship between the Fresnel number of a cavity and the losses experienced by a transverse mode

2- Assume we use the pinhole diaphragm technique to select the TEM_{00} mode in a 1m He-Ne concentric cavity. What should be the size of the pinhole?