Due date: 3/28

- Calculate FSR of a cavity with length of 1 meter. Compare it with a cavity with length of 1 mm.

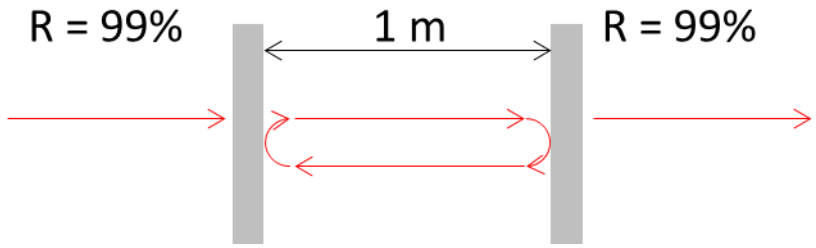
- I just bought a distributed feedback laser (DFB) laser with a linewidth of 2 MHz at 1550 nm. What is its coherence length?

- What does LASER stand for? State three main elements of laser.

- What is the difference between Finesse and Q-factor?

- What is the difference between spontaneous emission and stimulated emission?

- What does Population Inversion mean?



- What is the FSR of a cavity with 1-m length?

- If the reflectance of the cavity mirrors is 99%, what is its Q-factor at 1 um?

- What is its photon life time in the cavity?

- Assume a HeNe laser at 632.8 nm. The left mirror has a R1 (radius of curvature) of 2 m and a reflectance of 100%. The right mirror has a R2 of infinity and a reflectance of $\neq 100\%$. The distance between two mirrors is L = 1 m. The beam waist in the laser cavity is at the plane mirror (R2)

- Determine the spot size W_0 at the beam waist.
- Determine the laser-beam spot size W on the rear laser mirror.

- Determine the complex radius of curvature $\mathrm{q(z)}$ at z = 1 m and z = 0 m.
- What is the half-angle beam divergence for this laser in the far field?

- When $\lambda = 500\ \mathrm{nm}$, $W_0 = 10\ \mathrm{um}$, and $z_0 = 1\ \mathrm{mm}$, what is the q-parameter at the focal point? If there is a lens with f=2 cm at z = 2 cm and z = 4 cm, what is the size and location of the second waist? Use ABCD law.

- We would like to couple light ($\lambda = 1{,}550\ \mathrm{nm}$) into a single mode fiber (Corning, SMF-28e). Find an optimum condition. If you need a parameter, google it.