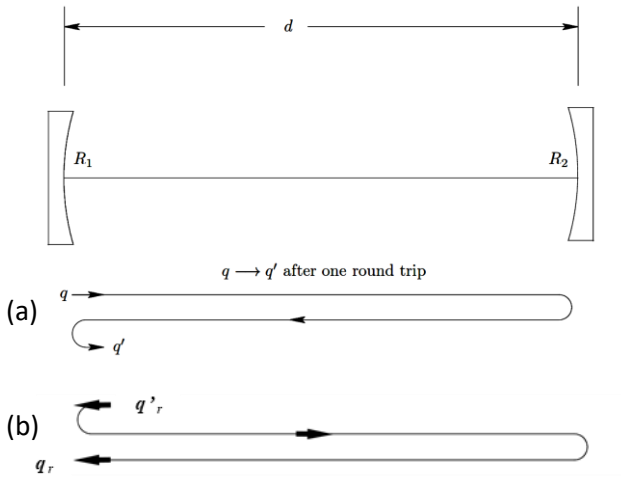
Homework #3 (Due date Oct. 26.)

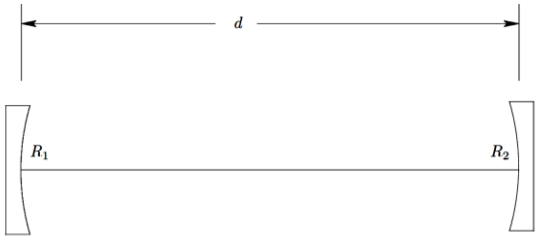
1. After solving the stability condition, the Eq. (2.3) of the textbook show two solutions. However, the both of solutions cannot give a proper q-parameter, since there should be only on the size and the Radius curvature of the beam shown in the Eq. (2.4) and Eq. (2.5). Then what would be the proper way of understanding the two solutions in the Eq. (2.3)?

2. Is the complex *q* parameter in the cavity dependent on the direction of the laser beam?



As an example, in the above figure, the *q* parameter in the case of (a) would be same or different from the q_r parameter in the case of (b)? Find both *q* and q_r parameters from the self-consistent solution and conclude that they are same or different.

3. In the following optical resonator, find the radius of curvature *R(z)* and width *w(z)* in terms of *z* and draw graphs such as *R(z)* vs z and *w(z)* vs. *z.* You may choose the values of R_1,R_2, and *d* in the stable condition (e.g. R_1 = 10 cm, R_2 = 12 cm, d = 8 cm, λ= 1 μm).



4. In the above optical resonator, discuss the location of the beam waist in the case of $R_1 < R_2$. The location is clear to mirror R_1 or R_2?