5.6. In the stable optical cavity shown in the diagram below, the plane \( z = 0 \) occurs at a distance 25 cm to the left of \( M_1 \) with the beam parameter \( z_0 = 125 \) cm. The distance between the two mirrors is 75 cm.

![Diagram of optical cavity](image)

(a) Find a formula for the resonant frequency of the TEM_{m,p,q} mode.
(b) Find the difference between the resonance frequency of the TEM_{1,2,q} and TEM_{0,0,q} modes.
(c) Find the radius of curvature for the mirrors \( M_1 \) and \( M_2 \).

5.7. Consider the optical cavity consisting of two flat mirrors with a converging lens as shown in the accompanying diagram.

(a) What are the stability limits for this cavity? Express your answer in the form of an inequality involving the ratio of \( d_1/f \) and \( d_2/f \).
(b) Construct a stability diagram expressing this inequality.

![Diagram of optical cavity with lens](image)

5.8. Find the spot sizes at the mirrors \( M_1 \) and \( M_2 \) of the cavity shown in Problem 5.7.

6.12. Drawn to scale on the graph below is the relative power transmission through a Fabry-Perot cavity when the distance \( d \) is increased slightly. The source is a He:Ne laser at \( \lambda_0 = 6328 \) Å.

![Graph of power transmission](image)

(a) What is the distance \( d_0 \)?
(b) What is the finesse of the cavity?
(c) What is the cavity \( Q \)?