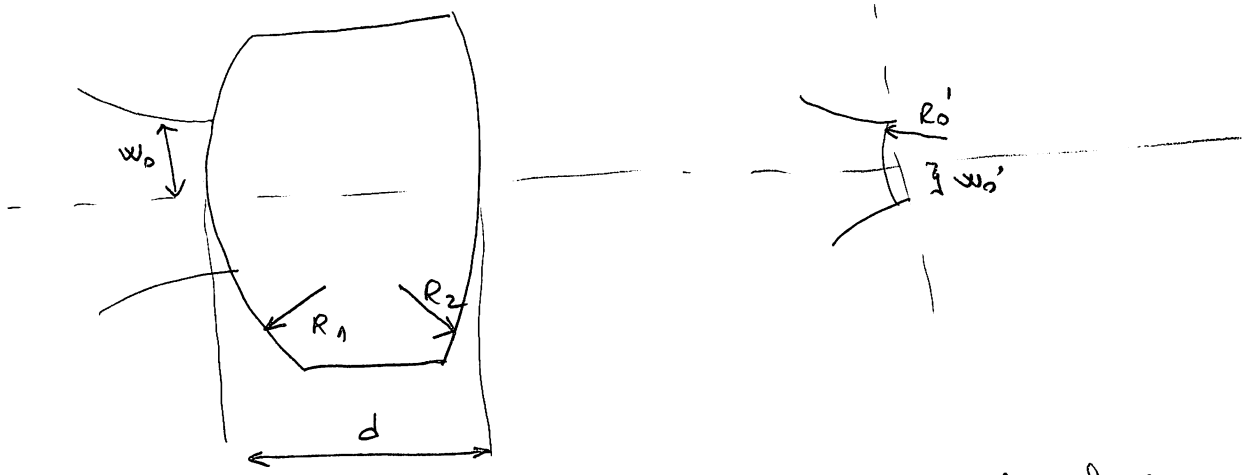
= HW 2 =

1. Consider the following thick lens:



a) Calculate the ABCD matrix associated with this lens

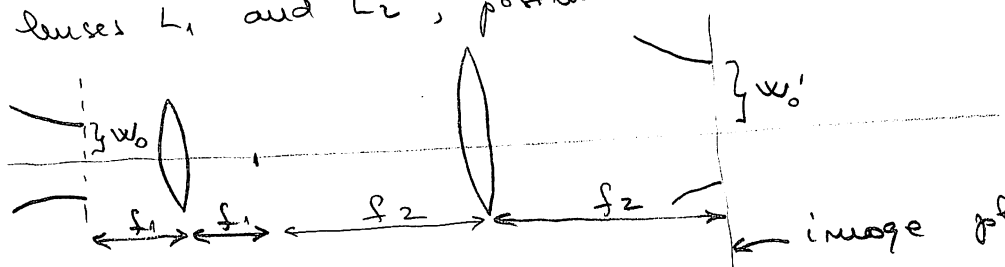
b) A Gaussian beam of width w_0 and radius of curvature R_0 is incident on the lens. Calculate the beam width (waist) w_0' and radius R_0' at the focal plane of the lens (first determine that focal plane).

2. A thin lens of focal distance f is placed at the plane of minimum waist of a Gaussian beam.

a) Find the distance d at which the beam is focused

b) Find the beam waist at that position

3. A Gaussian beam enters a microscope consisting of lenses L_1 and L_2, positioned as shown (a "4-f system").



Calculate w_0' and beam radius at the image plane.

DISPERSION

4. In class we calculated the frequency domain solution of the equation of motion, $\tilde{x}(\omega)$. Calculate its time domain counter part, $x(t)$.

5. A plane wave of spectrum $S(\omega) = \frac{1}{\Delta\omega} \cdot \frac{1}{1+\left(\frac{\omega-\omega_0}{\Delta\omega}\right)^2}$ is transmitted through a piece of material characterized by a resonant frequency ω_1 and damping coefficient γ.

a) What is the transmitted power spectrum, $S'(\omega)$

b) Calculate the correlation time of the transmitted field.