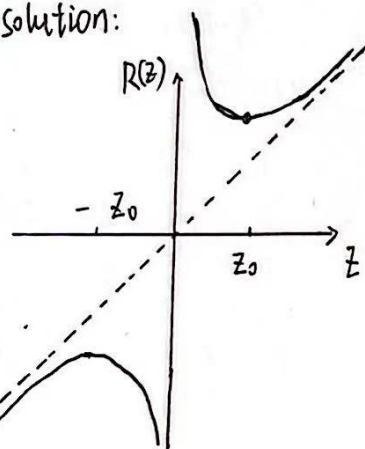


Jinsong Liu

1)
Solution:



2)

Solution:

$$A \quad z_0 = \frac{\pi w_0^2}{\lambda}$$

$$B \quad \frac{1}{q} = \frac{1}{R} + i \frac{\lambda}{\pi w^2}$$

$$C \quad \begin{bmatrix} 1 & d \\ 0 & 1 \end{bmatrix}$$

3)

Solution:

Let the q -parameter at the waist
be q_0

$$q_0 = iz_0 = i \frac{\pi w_0^2}{\lambda}$$

$$q_1 = q_0 + L = i \frac{\pi w_0^2}{\lambda} + L = iz_0 + L$$

$$\begin{aligned} q_2 &= \frac{Aq_1 + B}{Cq_1 + D} = \frac{q_1}{-\frac{1}{f}q_1 + 1} \\ &= \frac{iz_0}{-\frac{1}{f}iz_0 + 1} \\ &= \frac{iz_0 f}{f - iz_0} \end{aligned}$$