$R = 20.0$ cm

$f = \dfrac{R}{2} = \dfrac{(20.0 \text{ cm})}{2}$ $f = 10.0$ cm
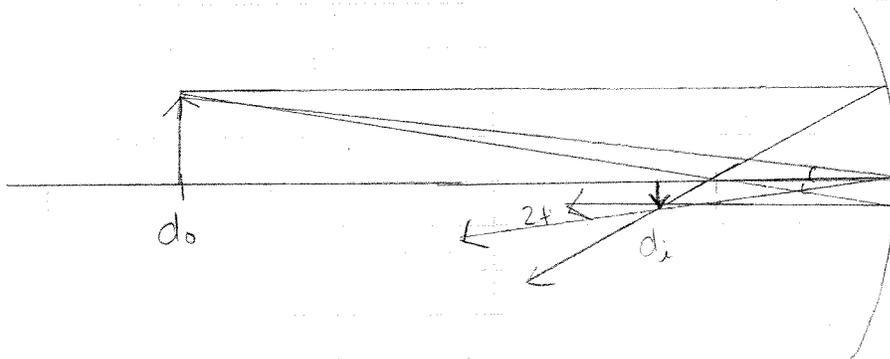
a) $f = 10.0$ cm
    $d_0 = 40.0$ cm

$$\dfrac{1}{d_0} + \dfrac{1}{d_i} = \dfrac{1}{f}$$

$$\dfrac{1}{40 \text{ cm}} + \dfrac{1}{d_i} = \dfrac{1}{10 \text{ cm}}$$

$$(40 \text{ cm})^{-1} + d_i^{-1} = (10 \text{ cm})^{-1}$$

$$\boxed{d_i = 13.3 \text{ cm}}$$

$M = \dfrac{-d_i}{d_0} = -\dfrac{(13.\overline{3} \text{ cm})}{(40 \text{ cm})}$

$$\boxed{M = -.33}$$

$$\boxed{\text{Real, Inverted}}$$