Angular Magnification

virtual image

magnifying glass

object

h_i

θ'

h_o

$(d_{near}$ = near point distance from eye.)

$\leftarrow d_o \rightarrow$

$\leftarrow d_i \rightarrow$
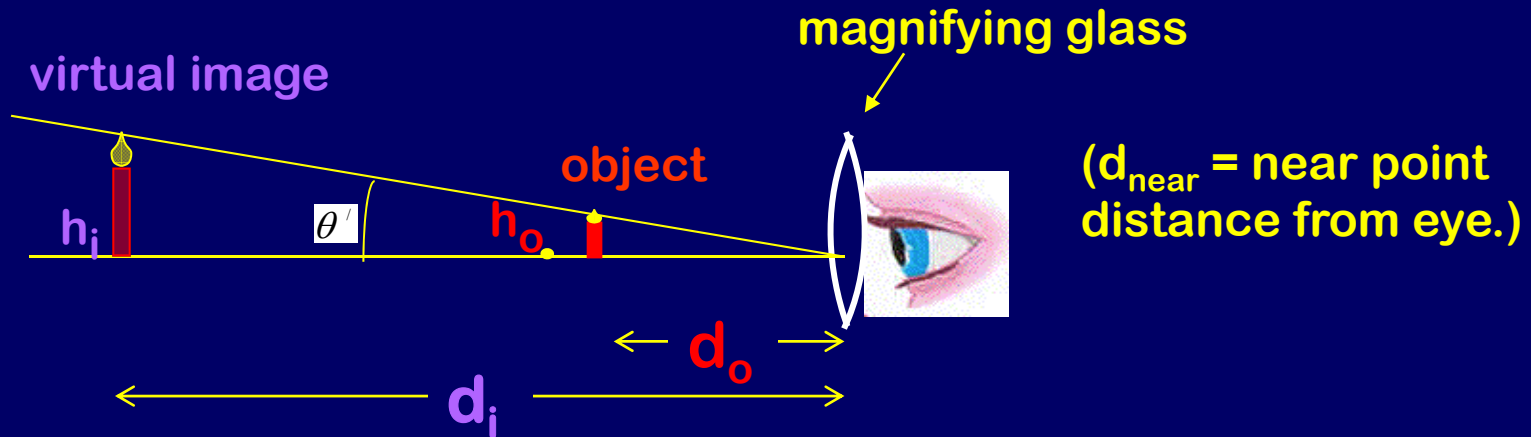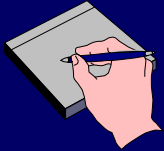
$$M = \frac{\theta'}{\theta} = \frac{h_o/d_o}{h_o/d_{near}} = \frac{d_{near}}{d_o}$$

For the lens: $\dfrac{1}{d_o} + \dfrac{1}{d_i} = \dfrac{1}{f} \Rightarrow \dfrac{1}{d_o} = \dfrac{1}{f} - \dfrac{1}{d_i}$

For max. magnification, put image at d_{near}:

so set d_i = -d_{near}: $\dfrac{1}{d_o} = \dfrac{1}{f} + \dfrac{1}{d_{near}}$

M = d_{near} /d_0 = $\boxed{d_{near}/f +1}$

Smaller f means larger magnification