Ch. 2 Prob. 57

$m = 3.00$

$f = 10.0\ cm$

$d_o = 7.50 cm$

a) Find the magnification when held 8.50 cm from the magnifier.

First use the Thin lense formula to find the image distance.

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \rightarrow \frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o} = \frac{1}{10\ cm} - \frac{1}{8.5\ cm}$$

$$\frac{1}{d_i} = -0.01765$$

$$d_i = -56.67\ cm$$

Magnification is Then

$$m = -\frac{d_i}{d_o} = -\frac{(-56.67)}{(8.50\ cm)} = 6.67$$

b) Find the magnification when held 9.50 cm from the magnifier.

$$\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o} = \frac{1}{10\ cm} - \frac{1}{9.50\ cm} = -5.26 \times 10^{-3}$$

$$d_i = -190\ cm$$

Magnification is Then

$$m = -\frac{d_i}{d_o} = -\frac{(-190\ cm)}{(9.50\ cm)} = 20$$

Magnification will increase until $d_o = f$. After that it can't be used as a magnifying glass.