

34. (a) Without the magnifier, $\theta = h/P_n$ (see Fig. 35-16). With the magnifier, letting $p = P_n$ and $i = -|i| = -P_n$, we obtain

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{i} = \frac{1}{f} + \frac{1}{|i|} = \frac{1}{f} + \frac{1}{P_n} .$$

Consequently,

$$m_\theta = \frac{\theta'}{\theta} = \frac{h/p}{h/P_n} = \frac{1/f + 1/P_n}{1/P_n} = 1 + \frac{P_n}{f} = 1 + \frac{25 \text{ cm}}{f} .$$

- (b) Now $i = -|i| \rightarrow -\infty$, so $1/p + 1/i = 1/p = 1/f$ and

$$m_\theta = \frac{\theta'}{\theta} = \frac{h/p}{h/P_n} = \frac{1/f}{1/P_n} = \frac{P_n}{f} = \frac{25 \text{ cm}}{f} .$$

- (c) For $f = 10 \text{ cm}$,

$$m_\theta = 1 + \frac{25 \text{ cm}}{10 \text{ cm}} = 3.5 \text{ (case (a))} \quad \text{and} \quad \frac{25 \text{ cm}}{10 \text{ cm}} = 2.5 \text{ (case (b))} .$$