

48. (a) We find $\Delta\lambda$ from $R = \lambda/\Delta\lambda = Nm$:

$$\Delta\lambda = \frac{\lambda}{Nm} = \frac{500 \text{ nm}}{(600/\text{mm})(5.0 \text{ mm})(3)} = 0.056 \text{ nm} = 56 \text{ pm} .$$

(b) Since $\sin\theta = m_{\text{max}}\lambda/d < 1$,

$$m_{\text{max}} < \frac{d}{\lambda} = \frac{1}{(600/\text{mm})(500 \times 10^{-6} \text{ mm})} = 3.3 .$$

Therefore, $m_{\text{max}} = 3$. No higher orders of maxima can be seen.