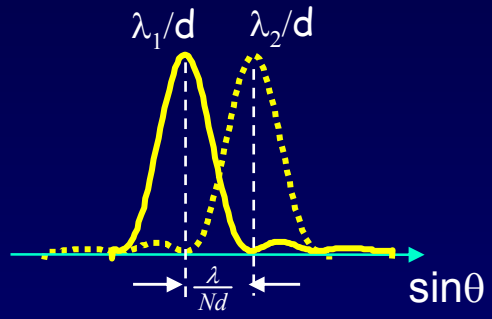
Diffraction Gratings (2)

We use Rayleigh's criterion:
The minimum wavelength separation we can resolve occurs when the λ_2 peak coincides with the first zero of the λ_1 peak:



So, the Raleigh criterion is $\Delta(\sin\theta)_{min} = \lambda/Nd$.

However, the location of the peak is $\sin\theta = m\lambda/d$.

Thus, $(\Delta\lambda)_{min} = (d/m)\Delta(\sin\theta)_{min} = \lambda/mN$:

$$\frac{\Delta\lambda_{min}}{\lambda} = \frac{1}{Nm}$$

Comments:

- It pays to use a grating that has a large number of lines, N. However, one must illuminate them all to get this benefit.
- It also pays to work at higher order (larger m): The widths of the peaks don't depend on m, but they are farther apart at large m.