43. The derivation is similar to that used to obtain Eq. 37-24. At the first minimum beyond the mth principal maximum, two waves from adjacent slits have a phase difference of $\Delta\phi = 2\pi m + (2\pi/N)$, where N is the number of slits. This implies a difference in path length of $\Delta L = (\Delta\phi/2\pi)\lambda = m\lambda + (\lambda/N)$. If θ_m is the angular position of the mth maximum, then the difference in path length is also given by $\Delta L = d\sin(\theta_m + \Delta\theta)$. Thus $d\sin(\theta_m + \Delta\theta) = m\lambda + (\lambda/N)$. We use the trigonometric identity $\sin(\theta_m + \Delta\theta) = \sin\theta_m \cos\Delta\theta + \cos\theta_m \sin\Delta\theta$. Since $\Delta\theta$ is small, we may approximate $\sin\Delta\theta$ by $\Delta\theta$ in radians and $\cos\Delta\theta$ by unity. Thus $d\sin\theta_m + d\,\Delta\theta\cos\theta_m = m\lambda + (\lambda/N)$. We use the condition $d\sin\theta_m = m\lambda$ to obtain $d\,\Delta\theta\cos\theta_m = \lambda/N$ and

$$\Delta\theta = \frac{\lambda}{Nd\cos\theta_m} \, .$$