$$E = E_1 + E_2 + E_3 = 2E_0 \cos\phi \sin(\omega t + \phi) + E_0 \sin(\omega t + \phi)$$
$$= E_0(1 + 2\cos\phi)\sin(\omega t + \phi) \quad (14.3.20)$$

where $\phi = 2\pi d \sin\theta / \lambda$. The intensity is proportional to $\langle E^2 \rangle$:

$$I \propto E_0^2 (1+2\cos\phi)^2 \langle \sin^2(\omega t + \phi) \rangle = \frac{E_0^2}{2}(1+2\cos\phi)^2 \quad (14.3.21)$$

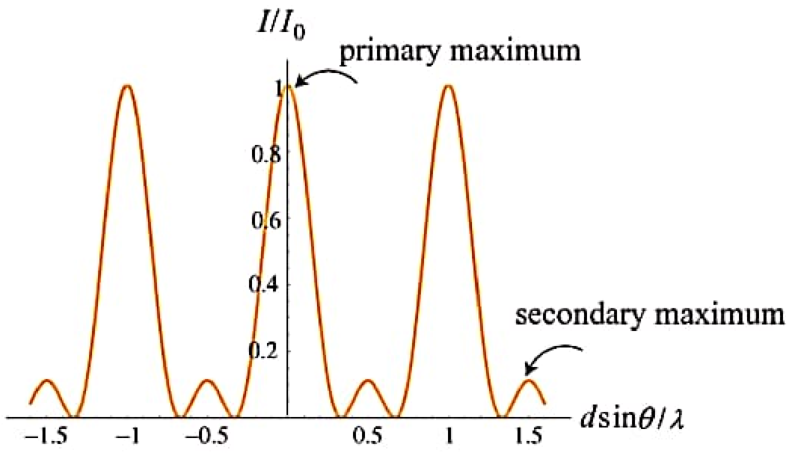
where we have used $\langle \sin^2(\omega t + \phi) \rangle = 1/2$. The maximum intensity I_0 is attained when $\cos\phi = 1$. Thus,

$$\frac{I}{I_0} = \frac{(1+2\cos\phi)^2}{9} \quad (14.3.22)$$

which implies

$$I = \frac{I_0}{9}(1+2\cos\phi)^2 = \frac{I_0}{9}\left[1 + 2\cos\left(\frac{2\pi d \sin\theta}{\lambda}\right)\right]^2 \quad (14.3.23)$$

(b) The interference pattern is shown in Figure 14.3.4.



From the figure, we see that the minimum intensity is zero, and occurs when $\cos\phi = -1/2$. The condition for primary maxima is $\cos\phi = +1$, which gives $I/I_0 = 1$. In addition, there are also secondary maxima which are located at $\cos\phi = -1$. The condition implies $\phi = (2m+1)\pi$, or $d\sin\theta/\lambda = (m + 1/2)$, $m = 0, \pm 1, \pm 2, \ldots$ The intensity ratio is $I/I_0 = 1/9$.