

40. (a) In a manner similar to that discussed in Sample Problem 36-5, we find the ratio should be  $d/a = 4$ . Our reasoning is, briefly, as follows: we let the location of the fourth bright fringe coincide with the first minimum of diffraction pattern, and then set  $\sin \theta = 4\lambda/d = \lambda/a$  (so  $d = 4a$ ).

(b) Any bright fringe which happens to be at the same location with a diffraction minimum will vanish. Thus, if we let

$$\sin \theta = \frac{m_1 \lambda}{d} = \frac{m_2 \lambda}{a} = \frac{m_1 \lambda}{4a},$$

or  $m_1 = 4m_2$  where  $m_2 = 1, 2, 3, \dots$ . The fringes missing are the 4th, 8th, 12th, and so on. Hence, every fourth fringe is missing.