

67. The central diffraction envelope spans the range  $-\theta_1 < \theta < +\theta_1$  where

$$\theta_1 = \sin^{-1} \frac{\lambda}{a} .$$

The maxima in the double-slit pattern are located at

$$\theta_m = \sin^{-1} \frac{m\lambda}{d} ,$$

so that our range specification becomes

$$-\sin^{-1} \frac{\lambda}{a} < \sin^{-1} \frac{m\lambda}{d} < +\sin^{-1} \frac{\lambda}{a} ,$$

which we change (since sine is a monotonically increasing function in the fourth and first quadrants, where all these angles lie) to

$$-\frac{\lambda}{a} < \frac{m\lambda}{d} < +\frac{\lambda}{a} .$$

Rewriting this as  $-d/a < m < +d/a$ , we find  $-6 < m < +6$ , or, since  $m$  is an integer,  $-5 \leq m \leq +5$ . Thus, we find eleven values of  $m$  that satisfy this requirement.