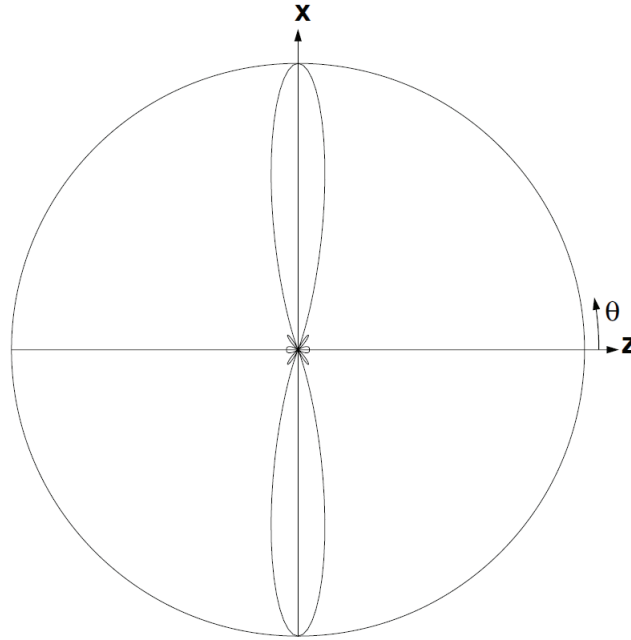


**9.41** Find and plot the normalized array factor and determine the half-power beamwidth for a five-element linear array excited with equal phase and a uniform amplitude distribution. The interelement spacing is  $3\lambda/4$ .

**Solution:** Using Eq. (9.121),

$$F_{\text{an}}(\theta) = \frac{\sin^2[(N\pi d/\lambda)\cos\theta]}{N^2 \sin^2[(\pi d/\lambda)\cos\theta]} = \frac{\sin^2[(15\pi/4)\cos\theta]}{25 \sin^2[(3\pi/4)\cos\theta]}$$

and this pattern is shown in Fig. P9.41. The peak values of the pattern occur at  $\theta = \pm 90^\circ$ . From numerical values of the pattern, the angles at which  $F_{\text{an}}(\theta) = 0.5$  are approximately  $6.75^\circ$  on either side of the peaks. Hence,  $\beta \approx 13.5^\circ$ .



**Figure P9.41** Normalized array pattern of a 5-element array with uniform amplitude distribution in Problem 9.41.