HW 1 Problem 3 Alternate Solution

[Yariv approach]

Since cavity is symmetric, could use

$$M_{TOT} = (M')^2$$

for $$M' = \begin{bmatrix} 1 & d \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ -\frac{2}{R} & 1 \end{bmatrix} = \begin{bmatrix} 1-\frac{2d}{R} & d \\ -\frac{2}{R} & 1 \end{bmatrix}$$

Then 12 passes through complete cavity is 24 passes through M', so want

$$24\Theta = 2\pi\ell$$

for $$\cos\Theta = \frac{A+D}{2} = 1-\frac{d}{R}$$

Still require ℓ reletively prime to 24, so

$$\ell = 1, 5, 7, 11, 13, 17, 19, 23$$

$$\Theta = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}$$

where other ℓ's just give negatives of these

So check: $$R = \frac{d}{1-\cos\Theta}$$

ℓ	1	5	7	11
R	880cm	40.5cm	23.8cm	15.3cm

Smallest $R = 15.3$cm