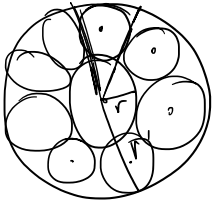


1. Sean C y C' dos circunferencias concéntricas de radios r y r' respectivamente, con $r < r'$. En la corona limitada por C y C' existen ocho circunferencias C_i , con tangentes a C y C' y de tal modo que C_i es tangente a C_{i+1} para $i = 1, 2, \dots, 7$, y C_8 es también tangente a C_1 . Determinar valor de $\frac{r'}{r}$.



$$d \frac{r'}{r} ?$$

$$\frac{360^\circ}{8} = \frac{180}{4} = 45^\circ = \frac{\pi}{4} \text{ rad}$$



$$\Rightarrow \frac{r+r'}{2} \text{ and } \frac{r'-r}{2}$$

$$\alpha = \frac{\pi}{8} \text{ rad}$$

$$\sin \frac{\pi}{8} = \sqrt{\frac{1 - \cos \pi/4}{2}} = \sqrt{\frac{1 - \sqrt{2}/2}{2}} = \sqrt{\frac{2 - \sqrt{2}}{4}} = \frac{\sqrt{2 - \sqrt{2}}}{2}$$

$$\sin \frac{\pi}{8} = \frac{(r'-r)/2}{(r+r')/2} = \frac{r'-r}{r+r'}$$

$$\boxed{\frac{\sqrt{2 - \sqrt{2}}}{2} = \frac{r'-r}{r+r'}}$$

$$(\sqrt{2 - \sqrt{2}})(r+r') = 2r' - 2r$$

$$\sqrt{2 - \sqrt{2}} r + \sqrt{2 + \sqrt{2}} r' = 2r' - 2r$$

$$(\sqrt{2 + \sqrt{2}} - 2) r' = (-\sqrt{2 - \sqrt{2}} - 2) r$$

$$\boxed{\frac{r'}{r} = \frac{+\sqrt{2 - \sqrt{2}} + 2}{-\sqrt{2 + \sqrt{2}} + 2}}$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$\cos^2 \alpha = 1 - \sin^2 \alpha$$

$$\cos 2\alpha = 1 - 2\sin^2 \alpha$$

$$\frac{1 - \cos 2\alpha}{2} = \sin^2 \alpha$$

$$\sin \frac{\alpha}{2} = \sqrt{\frac{1 - \cos \alpha}{2}}$$

