Question. Newtons ring are formed with reflected light of wavelength $5895\ \text{Å}$ with a liquid between the plane and curved surface .The diameter of $5\ th$ dark ring is $0.3\ cm$ and radius of curvature is $1\ m$. Determine the refractive index of liquid?

Given. $\lambda = 5895\ \text{Å} = 5895 \cdot 10^{-10}\ m;\ m = 5;\ d_m = 0.3\ cm = 0.3 \cdot 10^{-2}\ m;\ R = 1\ m;\ \beta = 0.$

Find. $n-?$

Solution.
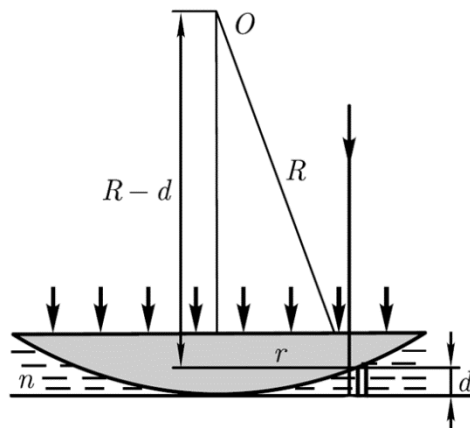
For the dark ring system:

$$2dn\cos\beta + \frac{\lambda}{2} = (2m+1)\lambda \quad \rightarrow \quad 2dn\cos\beta = m\lambda \quad \rightarrow \quad 2dn = m\lambda \quad \rightarrow \quad n = \frac{m\lambda}{2d}$$

From the figure

$$R^2 = (R-d)^2 + r^2$$
$$R^2 = R^2 - 2Rd + d^2 + r^2$$

Because d is very small, we have that

$$d = \frac{r^2}{2R}$$

Finally

$$n = \frac{4Rm\lambda}{d_m^2} = \frac{4 \cdot 1 \cdot 5 \cdot 5895 \cdot 10^{-10}}{(0.3 \cdot 10^{-2})^2} = 1.31$$

Answer. $n = 1.31$.