| NAME: | Quiz #3d: |
| | Phys270 |

1. [10 pts] A microscope is focused on a black dot. When a 1.0-cm-thick piece of plastic is placed over the dot, the microscope objective has to be raised by 0.5 cm to bring the dot back into focus. What is the index of refraction of the plastic? Show your work.

Solution to Quiz 5 : section 0103

When the plastic is in place, the microscope will focus on the virtual image of the dot. We draw the ray diagram corresponding to the case with and without the plastic piece.

0.5 cm

1 cm

S'

Virtual image

S
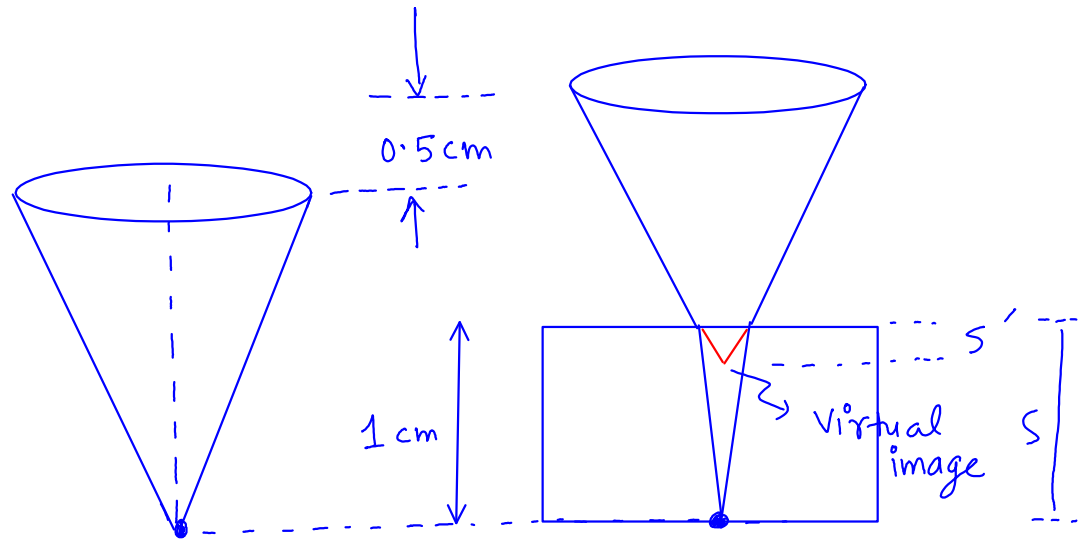
$$S = 1 \text{ cm}$$
$$S' = 1 - 0.5 = 0.5 \text{ cm}$$

Using $\quad S' = (n_{air}/n_{plastic}) \times S$

$$\Rightarrow \frac{n_{plastic}}{n_{air}} = \frac{S}{S'}$$

$$\Rightarrow n_{plastic} = \frac{S}{S'} \times n_{air} = \frac{1}{0.5} \times 1 = 2$$