Answer on Question #52728-Physics-Optics

An object placed in front of a concave mirror of radius 20 cm produces an inverted image which is one-fifth the size of the object. How far is the object from the mirror?

30 cm

40 cm

50 cm

60 cm

Solution

We know

$$\frac{1}{d_o}+\frac{1}{d_i}=\frac{1}{f}.$$

Magnification is

$$M=-\frac{d_i}{d_o}=-\frac{1}{5}.$$

Thus,

$$d_i=\frac{d_o}{5}.$$

So,

$$\frac{1}{d_o}+\frac{1}{\frac{d_o}{5}}=\frac{1}{f}\rightarrow\frac{6}{d_0}=\frac{1}{f}.$$

$$d_0=6f=6\frac{R}{2}=3R=3\cdot 20\ cm=60\ \text{cm}\,.$$

Answer: 60 cm.