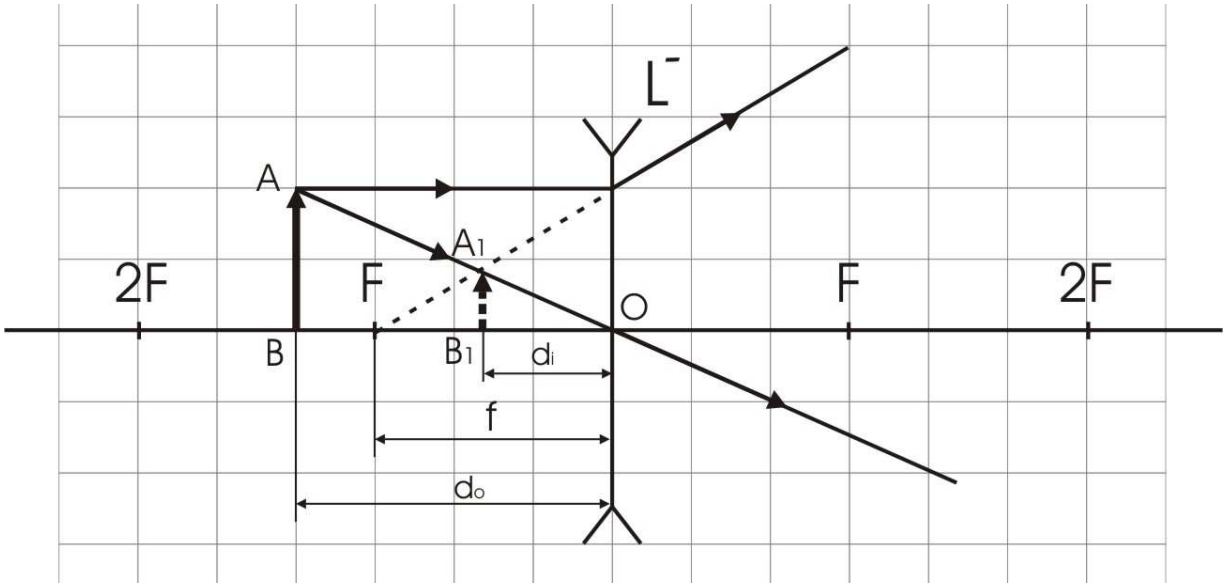
An object is placed 4 cm in front of a concave lens of focal length 3 cm. Using the lens equation, find where the image will form and state whether it is a real or virtual image.

Solution.

$$d_o = 4cm = 0.04m, f = 3cm = 0.03m;$$

$$d_i - ?$$



Symbols in the drawing:

L^- – a concave lens;

d_o – a distance from the object to the center of the lens;

d_i – a distance from the image to the center of the lens;

f – a focal length of the lens;

AB – object;

A_1B_1 – image.

Thin Lens Equation:

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

A smaller virtual upright image is formed in front of the lens, because the concave lens is diverging.

f is negative, because the concave lens is diverging.

d_i is negative, because the image is formed in front of the lens.

There is the equation for this lens:

$$\frac{1}{d_o} - \frac{1}{d_i} = -\frac{1}{f};$$

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

$$\frac{1}{d_i} = \frac{f + d_o}{f \cdot d_o};$$

$$d_i = \frac{f \cdot d_o}{f + d_o};$$

$$d_i = \frac{0.03 \cdot 0.04}{0.03 + 0.04} = 0.017(m);$$

$$d_i = 0.017m = 1.7cm;$$

Answer: A smaller virtual upright image is formed in front of the lens. A distance from the image to the center of the lens is: $d_i = 1.7cm$.