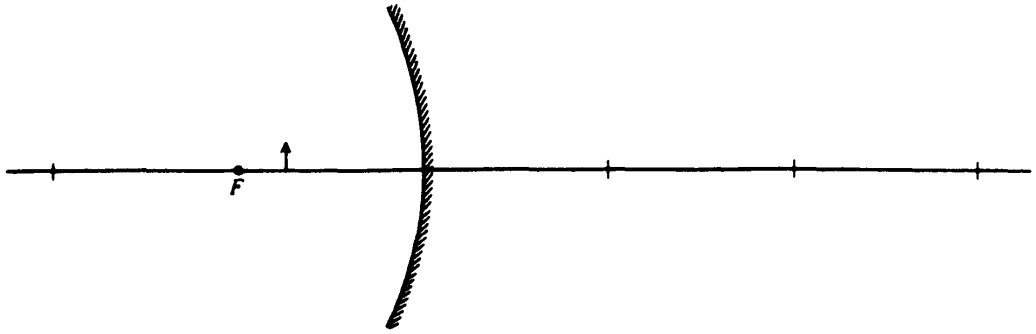



1983B5. The concave mirror shown above has a focal length of 20 centimeters. An object 3 centimeter high is placed 15 centimeters in front of the mirror.

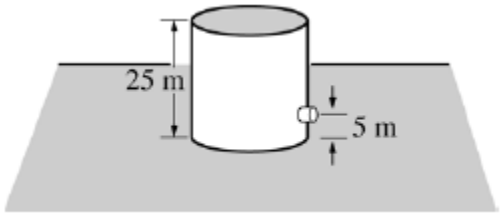
a. Using at least two principal rays, locate the image on the diagram above.

b. Is the image real or virtual? Justify your answer.

c. Calculate the distance of the image from the mirror.

d. Calculate the height of the image.

**#7 (B2005-B5)**



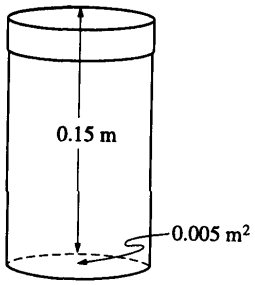

A large tank, 25 m in height and open at the top, is completely filled with saltwater (density 1025 $kg/m^3$). A small drain plug with a cross-sectional area of $4.0 \times 10^{-5}$ $m^2$ is located 5.0 m from the bottom of the tank.

The plug breaks loose from the tank, and water flows from the drain.

(a) Calculate the force exerted by the water on the plug before the plug breaks free.

(b) Calculate the speed of the water as it leaves the hole in the side of the tank.

(c) Calculate the volume flow rate of the water from the hole.




1996B7 The inside of the cylindrical can shown above has cross-sectional area 0.005 $m^2$ and length 0.15 m. The can is filled with an ideal gas and covered with a loose cap. The gas is heated to 363 K and some is allowed to escape from the can so that the remaining gas reaches atmospheric pressure ($1.0 \times 10^5$ Pa). The cap is now tightened, and the gas is cooled to 298 K.

a. What is the pressure of the cooled gas?

b. Determine the upward force exerted on the cap by the cooled gas inside the can.

c. If the cap develops a leak, how many moles of air would enter the can as it reaches a final equilibrium at 298 K and atmospheric pressure? (Assume that air is an ideal gas.)